

**Draft Environmental Impact Statement for the
Proposed Amendment 003, Garnet USA, LLC,
Operating Permit 00157:**

Garnet USA Mine Project

Madison County, Montana

September 2013



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Executive Summary

This Executive Summary provides an overview of the contents of the Draft Environmental Impact Statement (EIS) for the Garnet USA, LLC (Garnet USA) Hard Rock Mine Operating Permit 00157, Amendment 003. The Draft EIS describes the land, people, and resources potentially affected by the proposed mining activities. The mine is located in Madison County, in southwestern Montana. This summary does not provide all of the information contained in the Draft EIS. If more detailed information is desired, please refer to the Draft EIS, its appendices, or referenced reports.

The EIS presents descriptions of the Proposed Action and alternatives, including the No Action Alternative and the Agency-Mitigated Alternative (Chapter 2); descriptions of the existing environment for all potentially affected resources (Chapter 3); and an analysis of the environmental consequences of the alternatives (Chapter 4).

ES-1: Introduction

Garnet USA holds Operating Permit No. 00157 which has been amended twice since it was issued in 1995. Garnet USA also holds Exploration License No. 00642, issued by the Department of Environmental Quality (DEQ) in 2013, which allows for exploration activities at the Red Wash Hard Rock (RWHR) Mine site. Throughout this document it is important to distinguish between activities that have already been authorized as part of the 1995 operating permit or the exploration license and those that are being considered under this EIS as part of the draft operating permit amendment. To clarify, the exploration license allows exploration activities only. This amendment to the 1995 operating permit, if approved, would allow mining to proceed at the RWHR Mine site.

ES-2: Purpose and Benefits of the Proposed Action

DEQ has received an application from Garnet USA to amend Operating Permit No. 00157. The purpose of the proposed amendment is to allow Garnet USA to mine garnet ore at a new site known as the RWHR site. Hard Rock Operating Permit No. 00157 currently covers a processing plant at the Alder Gulch Mine site, located approximately one mile east of Alder, Montana and the Red Wash Alluvial site, which previously has been mined and reclaimed. The proposed permit boundaries for the project are shown in Figure ES-1-1.

ES-3: Project Area Description

The geographic scope of this Draft EIS includes areas near the town of Alder, Montana in Madison County. The areas potentially affected by the Proposed Action include existing infrastructure related to the Garnet USA Alder Gulch processing plant, the Red Wash Alluvial site, the proposed RWHR Mine, and the areas within the proposed mine permit boundaries, as well as an alternate access road connection to the processing plant (Figure ES-1-2).

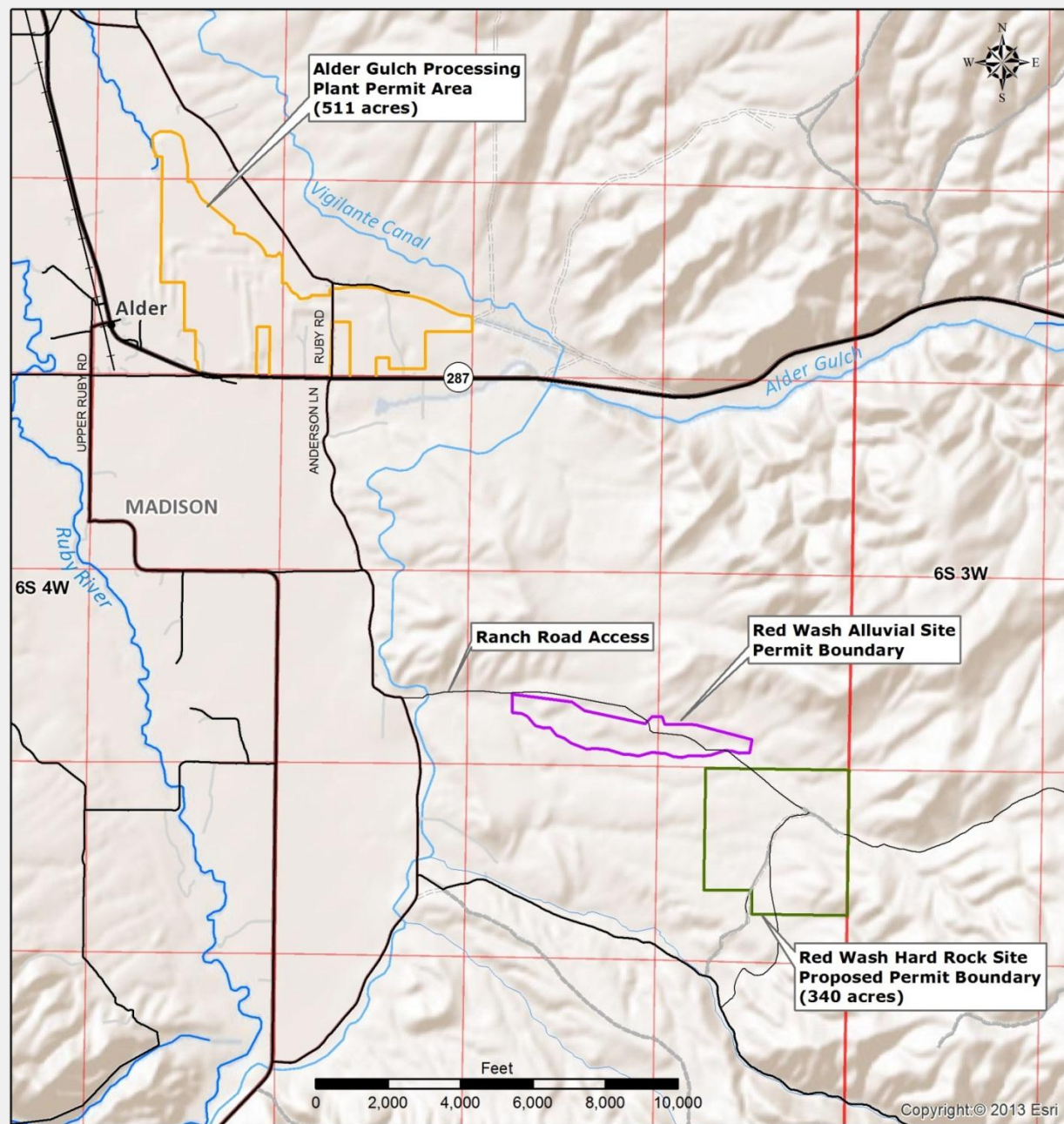


Figure ES-1-1. Permit Area Boundaries for the Alder Gulch Processing Plant, the Red Wash Alluvial Mine Site (reclaimed), and the Red Wash Hard Rock Mine Site, Madison County, Montana.

ES-4: Scope of the Decision to be Made

This EIS will focus on the decision to be made by DEQ related to approving an amendment to Garnet USA's operating permit as submitted in February 2013 (Garnet USA, 2013). DEQ must determine whether the operating permit amendment application satisfies the requirements of the Montana Metal Mine Reclamation Act (MMRA), Title 82, Chapter 4, Part 3, Montana Code Annotated (MCA).

The DEQ Director will use the EIS process to develop the information necessary to determine whether the Proposed Action meets the performance standards of the MMRA, including but not limited to:

- The removal of buildings and other structures at closure consistent with the post-mine land uses;
- Post-closure environmental monitoring programs and contingency plans;
- Compliance with state air and water quality standards.

The DEQ Director will issue a Record of Decision (ROD) documenting the decision on the operating permit amendment. The ROD is a public notice of what the decision is, the reasons for the decision, and any special conditions surrounding the decision or its implementation.

ES-5: Public Involvement

DEQ opened the scoping period for this EIS on March 26, 2013. On April 16, 2013 DEQ held a scoping meeting in Alder, Montana at the Alder Community Hall. Comments made at the meeting and those received via postal mail or e-mail were compiled by DEQ and entered into the administrative record. The scoping period ended on April 26, 2013. DEQ published notices of the scoping period and the scoping meeting in the Butte newspaper, the *Montana Standard*, on Sunday, March 24 and Sunday, March 31, 2013 and in the Ennis newspaper, the *Madisonian* on March 28 and April 3, 2013. In addition, DEQ mailed scoping notices to over 150 agencies and individuals who had expressed interest in the project.

Issues were identified through the agency and public scoping process, through DEQ's review of the 2013 Operating Permit Amendment Application, and through interagency discussions on the development of alternatives. Issues were evaluated to determine whether the Proposed Action or an alternative would result in significant impacts. The Montana Environmental Policy Act (MEPA) provides direction on determining the significance of impacts (ARM 17.4.608(1), MCA 75.1.201).

The major issues identified include:

Water Management

- Groundwater quality
- Surface water quality
- Long-term monitoring of water quality

Transport of Ore Materials

- Use of county and state roads
- Alignment of haul route and access to the processing plant
- Potential impacts to safety at the processing plant access
- Potential for noise and dust from ore transport

ES-6: Alternatives Description

Alternatives fully evaluated in this EIS are the No Action Alternative, the Proposed Action, and the Agency-Mitigated Alternative. Some additional alternatives were evaluated and eliminated from further consideration. Complete descriptions of each alternative are provided in Chapter 2 of the Draft EIS.

No Action Alternative

Under the No Action Alternative, DEQ would not approve Garnet USA's operating permit amendment. Garnet USA currently holds Operating Permit No. 00157 and has developed or is using previously developed areas covering approximately 70 acres within the Alder Gulch processing plant permit area boundary. The No Action Alternative assumes that Garnet USA could continue any and all activities approved under its operating permit and exploration license; therefore, the No Action Alternative is a "status quo" approach.

Proposed Action

The Proposed Action would allow garnet mining at the RWHR site, adding 340 acres to the mine operating permit area. About 213 acres of this permit area would be disturbed over the life of the RWHR Mine. Approximately one-third of the total RWHR acreage proposed for amendment (127 acres) would remain undisturbed. The mining plan for the RWHR Mine site is to extract garnet-bearing rock using standard quarry mining methods. Garnet ore would be hauled to the Alder Gulch processing plant where it would be washed, sorted, and processed for sale and distribution. After mine closure, the area would be reclaimed in compliance with MMRA.

Agency-Mitigated Alternative

MEPA allows the decision-making agency to propose alternatives to the Proposed Action that would meet the purpose and benefits while reducing or mitigating potential impacts. The Agency-Mitigated Alternative may include changes to some aspects of the Proposed Action while other aspects remain unchanged. The two aspects of the Proposed Action addressed under the Agency-Mitigated Alternative are the haul truck entrance to the Alder Gulch processing plant and groundwater protection, both of which were issues identified in the EIS scoping process.

Under the Agency-Mitigated Alternative, the potential impacts due to conflict between ore haul trucks and local traffic may be reduced if Garnet USA chooses to modify the route of the haul trucks as they enter and leave the plant. Once the haul trucks cross State Route 287 and travel along the south end of Ruby Road, trucks on the modified route would turn left and enter the plant site via a new northwest-trending access road that takes the trucks

directly toward the main plant area. The new entrance and road into the plant would remove ore trucks from Ruby Road north of the entrance and isolate them from the residents located further north.

The Agency-Mitigated Alternative would expand the current groundwater monitoring plan to include more sampling points and to analyze for nitrogen compounds incorporated in the garnet ore from blasting at the RWHR Mine site. Garnet USA would expand the current groundwater monitoring plan to include more sampling points and to analyze for nitrate in surface water and groundwater. This expanded monitoring would provide a broader characterization of baseline water quality conditions, allow a comparison of future water quality compared to current conditions, identify potential leakage from the two lined process ponds, identify the impact (if any) of the water and sewer district Land Application Disposal (LAD) site, and evaluate if nitrogen compounds are present beneath or migrating from the Alder Gulch site.

Alternatives Considered and Eliminated

During scoping, the possibility of moving the processing plant from the Alder Gulch Mine site to the RWHR site was put forward by members of the Alder community. Operation of the processing plant at the Alder Gulch Mine site, however, is currently permitted under Operating Permit No. 00157. Garnet USA did not include relocation of the processing plant in its application to amend the operating permit. Because relocation of the processing facility is neither requested by Garnet USA nor within DEQ's unilateral authority, relocation of the processing facility to the RWHR site will not be considered in detail.

ES-7: Analysis of Alternatives

The following sections provide a summary of the effects of implementing each alternative. Information is focused on activities and effects where different levels of effects can be distinguished between alternatives. Detailed effects analyses for each alternative are found in Chapter 4 of the Draft EIS.

Garnet USA's proposed activities were found to have minimal to no effect on several of the resource areas analyzed, and minimal differences exist between the potential effects of each alternative. These resource areas include hazardous materials, air quality, power supply, cultural resources, socioeconomics, land use, recreation, visual scenery, and wildlife. These resource areas are not discussed further in this summary and a more detailed description of potential effects is found in Chapter 4 of the Draft EIS.

Resource areas where there could be potentially substantial impacts under one or more alternatives include geology, soils, vegetation and wetlands, surface water, groundwater, noise, transportation, and fisheries. The differences in potential effects between alternatives for these resource areas are described in the sections below. Potentially substantial impacts are summarized in Table ES-1.

Geology

Under the Proposed Action, the removal of 500,000 tons of waste rock and ore per year over a 37 year-period would have an impact on the surface geology at the RWHR mine site. The geology within the mined area would be permanently altered with the removal of garnet-bearing bedrock for garnet-processing. The extent of mine excavation would exist beyond the life of the mine. The removal of ore and waste rock volume from the RWHR Mine site is an irreversible impact.

Soils

Under the Proposed Action, some soil would be irrevocably lost during soil removal, construction, and operation of the mine prior to the reestablishment of vegetation. Secondary impacts to soil resources could result from increased wind and water erosion if surface disturbance exposes soils. Stockpiling would destroy soil structure, reduce soil biological activity, increase compaction and bulk density, and decrease the soil organic matter content. These are unavoidable impacts of permitting disturbance of the site for mining. Even with reclamation, there would be changes to the soil profile and make-up of the soils in the reclaimed areas that may limit vegetation reestablishment. The arid nature of the climate would contribute to a slow recovery of the soil structure.

Under the Agency-Mitigated Alternative there would be approximately 0.5 additional acres of soil disturbance on leveled, naturally revegetated placer tailings resulting from the construction of a new haul truck access road that runs diagonally between the plant shop and office, and Ruby Road near the intersection with the State Route 287.

Vegetation and Wetlands

There would be impacts to vegetation, wetlands, or weeds under the No Action Alternative if the dredge piles are reprocessed. No additional surface disturbance is included in this Alternative.

The Proposed Action would result in temporary impacts to vegetation and soil from construction of roads and facilities. There would be approximately nine acres of additional disturbance for new ponds, the visibility berm, boneyard relocation, and employee parking areas under the Proposed Action. Secondary impacts to vegetation would include the potential for noxious weeds to spread due to disturbed acreage and an overall decrease in vegetation community diversity after reclamation is completed.

The Agency-Mitigated Alternative would result in an additional 0.5 acres of surface disturbance within the Alder Gulch processing plant site from the proposed diagonal access road construction. In addition, approximately 0.06 acres of wetlands would be filled or disturbed to construct the access road. Increasing the area of disturbance would increase the potential for weed spread. Garnet USA has an approved weed control plan in place to minimize weed spread and colonization that would apply under any alternative.

Surface Water

Under the No Action Alternative, reprocessing the dredge tailings at the processing plant in the future could impact surface water resources.

Under the Proposed Action, impacts to surface water resources at both the Alder Gulch Mine site and the RWHR Mine site may occur. At the Alder Gulch Mine site, recirculation and reuse of water from the lined recycling ponds during garnet processing may allow nitrogen compounds originating from blasting residue to concentrate in the recycling pond waters and these could potentially be released to groundwater or surface water. A surface water and groundwater monitoring plan is in place to establish a baseline of water quality at the plant site. This plan includes a future sampling schedule.

Primary impacts to surface water resources at the RWHR Mine site would include irreversible alterations to the ephemeral drainages. Post-closure, drainage patterns would be identified and incorporated into reclamation to approximate pre-mine drainage patterns where possible. Potential secondary impacts under the Proposed Action include wind erosion and surface water runoff which would carry sediment and nitrogen compounds offsite and increase concentrations in groundwater and surface water resources.

Under the Agency-Mitigated Alternative, construction of the access route would increase surface disturbance near Alder Gulch and may introduce sediment or pollutants to the stream or wetlands.

Groundwater

Under the Proposed Action, some impact to groundwater resources at the Alder Gulch Mine site may occur. The processing ponds at the Alder Gulch Mine site would be lined to minimize the potential interaction of processing water with underlying groundwater. The concentration of nitrogen compounds in these ponds may be a concern if the liners leak. A surface water and groundwater monitoring plan is in place to establish a baseline of water quality at the plant site and includes a future sampling schedule.

Additional monitoring, to include new monitoring wells and parameters, is proposed as part of the Agency-Mitigated Alternative at both the Alder Gulch processing plant and the RWHR Mine site.

Noise

There would be minimal impacts to noise under the No Action Alternative as the approved level of activity at the processing plant, although intermittent, would be expected to remain the same.

Under the Proposed Action, processing plant operations between 7:00 a.m. and 5:00 p.m. would be barely to clearly audible above ambient, background noise. If the plant operates continuously for 24 hours per day, the +14 decibel (dBA) increase would be considered more than twice as loud as the L_{dn} 40 dBA ambient noise without the plant operating, which would be a significant noise impact at residences near the Alder Gulch site.

Noise levels of the diesel equipment and rock drill at the RWHR site at the closest residence one mile west of the site would be similar to the noise levels during exploration, and would not constitute a noticeable impact to noise levels. The increased haul truck traffic under the Proposed Action may create a moderate noise impact.

Socioeconomics

There would be minimal impacts to socioeconomics under the No Action Alternative as the current level of employment and economic activity would be expected to remain the same.

Under the Proposed Action, 30 to 60 jobs would be created at the Garnet USA facilities. These jobs would be expected to pay more than the average wage for Madison County and to persist for the life of the project. A total of 50 to 99 new employment opportunities would be generated in Madison County as a result of the Proposed Action (Cummins, 2013).

Transportation

All alternatives under consideration include hauling some garnet ore from the RWHR Mine site to the Alder Gulch processing plant. Under the No Action and Proposed Action, trucks would enter the plant using the existing East Road off of Ruby Road. Approximately 8 truck trips per day would occur under the No Action Alternative for a short period of time under the exploration license, and approximately 45 truck trips per day are anticipated under the Proposed Action. Primary impacts to transportation from these two alternatives could include delays to traffic as the haul trucks cross State Route 287 to Ruby Road from Anderson Lane. Impacts due to noise, light, and dust would increase under the Proposed Action as compared to the No Action Alternative.

Under the Agency-Mitigated Alternative, trucks would use a new angled road, constructed near the southeastern corner of the Alder Gulch permit area. The new road would allow trucks to enter the plant without driving past residences on Ruby Road. Another component of the Agency-Mitigated Alternative would be to extend the proposed visibility berm across the East Road and abandon the use of that road. These components would reduce potential impacts by improving the truck access alignment as it crosses State Route 287 and eliminating trucks and other mine-related traffic from a portion of Ruby Road.

Fisheries

Impacts to fisheries would be linked to potential impacts to groundwater and surface water as described above. There is the potential for some increase in surface water level fluctuations at the Alder Gulch site due to each of the alternatives under consideration. Garnet USA would monitor surface and groundwater quality under all alternatives, and an increased level of groundwater monitoring is proposed under the Agency-Mitigated Alternative. Monitoring would increase the likelihood that contaminants would be detected if they reach the groundwater or surface water where they would impact fisheries. The contaminants most likely to cause negative impacts are the nitrates originating from explosive residue in the ore and waste rock. However, it is unlikely that these contaminants would impact fisheries because the ponds where they would be deposited will not contain fish and will be lined to prevent contaminants from entering the groundwater.

Table ES-1. List of Potential Impacts by Resource Area for the Alternatives Under Consideration.

Resource	No Action Alternative	Proposed Action	Agency-Mitigated Alternative
Geology	Alternative would result in removal of 10,000 tons of rock and ore under the exploration license. No additional impacts at the permitted Alder Gulch processing plant.	Alternative would result in removal of 500,000 tons per year of waste rock and ore. Yields are estimated to be 50,000 tons per year of finished garnet product. Surface geology would be permanently disturbed.	The level and extent of impacts to geology and geochemistry under this Alternative would be the same as that expected under the Proposed Action.
Soils	Alternative would result in minimal impacts to soil resources. All previously permitted surface disturbances that affect soil resources have already occurred.	Some soil would be irrevocably lost during soil removal, construction, and operation of the mine prior to the reestablishment of vegetation. Even with reclamation, there would be changes to the soil profile, structure, and make-up of the soils in the reclaimed areas that may limit vegetation reestablishment. The arid nature of the climate would contribute to a slow recovery of the soil structure.	<p>The level and extent of impacts to soils at the RWHR site under this Alternative would be the same as that expected under the Proposed Action.</p> <p>Approximately 0.5 acres of additional disturbance would be required for the development of the access route. This would not constitute substantial additional primary, secondary, or cumulative impacts to the soil resources at the Alder Gulch site.</p>

Resource	No Action Alternative	Proposed Action	Agency-Mitigated Alternative
Vegetation and Wetlands	Alternative would result in some impacts to vegetation resources if dredging is reinitiated. All other previously permitted surface disturbances that affect vegetation resources have already occurred.	<p>Alternative would result in temporary impacts to vegetation and soil from construction of roads and facilities. Long term impacts would include changes in vegetation communities and a decrease in community diversity after reclamation.</p> <p>Noxious weeds have the potential to spread due to disturbed acreage.</p>	<p>Development of the alternative Alder Gulch site access road would increase impacts to vegetation and wetlands. Approximately 0.06 acres of wetlands are expected to be filled or disturbed during road construction.</p> <p>Increasing the area of disturbance may increase the potential for weed spread.</p>
Surface Water	There would be primary and secondary impacts to surface water if dredging of tailings is pursued through implementation of the No Action Alternative. All other previously permitted disturbances that affect surface water resources have already occurred.	<p>Recirculation and reuse of water during processing separation may allow for a concentration of nitrogen compounds in the water that could potentially be released to groundwater or surface water. A surface water and groundwater monitoring plan is in-place to establish a baseline of water quality at the plant site. This plan includes future sampling as needed.</p> <p>Primary impacts to surface water resources at the RWHR Mine site would include irreversible alterations</p>	Construction of the access route would increase surface disturbance near Alder Gulch and may introduce sediment or pollutants to the stream or wetlands.

Resource	No Action Alternative	Proposed Action	Agency-Mitigated Alternative
		to the ephemeral drainages. Potential secondary impacts include wind and surface water runoff which would carry sediments and nitrogen compounds offsite and increase concentrations in nearby surface water resources.	
Groundwater	There would be limited potential for primary and secondary impacts to groundwater through implementation of the No Action Alternative if redredging of the tailings piles is pursued. All previously permitted disturbances that affect groundwater resources have already occurred.	There would be no primary impacts to the groundwater from the newly constructed, lined ponds because they would not intersect the water table. The lined ponds could have secondary impacts to the groundwater if a liner leaked. A leak could allow recycled process water with nitrogen compounds to reach groundwater.	<p>The level and extent of impacts to groundwater under this Alternative would be the same as that expected under the Proposed Action.</p> <p>Additional groundwater monitoring is proposed as part of this alternative.</p>
Air Quality	There would be no primary or secondary impacts to air quality through implementation of the No Action Alternative. All activities that affect air quality resources are previously permitted.	The level of impact to air quality would increase in duration, but not in intensity as the project is expected to continue for 37 years.	The level and extent of impacts to air quality under this Alternative would be the same as that expected under the Proposed Action.

Resource	No Action Alternative	Proposed Action	Agency-Mitigated Alternative
Noise	<p>The noise levels of the equipment and activities for the No Action Alternative were based on when the plant is operating, as it has intermittently over the last several decades. There would be no primary or secondary noise impacts for the No Action Alternative.</p>	<p>Plant operations between 7:00 a.m. and 5:00 p.m. would be barely to clearly audible because the incremental increase above ambient noise levels would only be +3 to +6 dBA. If the plant operates continuously for 24 hours per day, the +14 dBA increase would be considered more than twice as loud as the L_{dn} 40 dBA ambient noise without the plant operating, which would be a significant noise impact at residences near the Alder Gulch site.</p> <p>Noise levels of the diesel equipment and rock drill at the RWHR site at the closest residence one mile west of the site would be similar to the noise levels during exploration.</p> <p>The increased haul truck traffic may create a moderate noise impact.</p>	<p>All aspects of the Agency Mitigated Alternative would be the same as the Proposed Action, except that the ore truck access to the Alder Gulch processing plant would be redirected from Ruby Road. The proposed access road would move the haul truck traffic farther from the Ruby Road residences and would reduce the truck noise at the residences.</p>
Socioeconomics	<p>The No Action Alternative would retain the existing workforce at the Alder Gulch processing plant. If the amendment to the mine permit is not granted, this could ultimately result in the shutdown of the plant.</p>	<p>Under the Proposed Action, Garnet would increase its employees to 30-60 individuals. These jobs are likely to pay wages higher than the average for Madison County, and would constitute a localized, long-term benefit to the community.</p>	<p>All aspects of the Agency Mitigated Alternative would be the same as the Proposed Action. The access road construction may generate a small number of additional short-term jobs in the community.</p>

Resource	No Action Alternative	Proposed Action	Agency-Mitigated Alternative
Transportation	Alternative would include highway-legal dump trucks hauling approximately four to eight truckloads per day for a limited period of time using Anderson Lane and Ruby Road under the exploration license. Other potential primary impacts due to haul truck and other traffic would include increased noise, dust, and lights from truck traffic on Ruby Road in front of residences.	This Alternative would increase the number of truck trips between the RWHR Mine site and the processing plant to 45 truck trips per operating day. The most likely times for the haul trucks to affect other traffic would be in the morning and evening commute hours, during school bus loading time, and seasonally in the summer when tourism increases traffic on State Route 287. Primary impacts to transportation could include delays to traffic as the haul trucks cross State Route 287 to Ruby Road from Anderson Lane. Impacts due to noise, light, and dust would increase as compared to the No Action Alternative. Increasing traffic on local roads may cause an increase in traffic accidents.	The alternative access road would not reduce the number of truck trips described under the Proposed Action, but it would provide a shorter and more direct haul route to the processing plant. The partial realignment of Anderson Lane and Ruby Road may allow trucks to cross State Route 287 more efficiently. This could also reduce the overall likelihood of conflict with other traffic and increase traffic safety along the route. The angled access route would reduce the potential for impacts due to noise, dust, and light along Ruby Road.

Resource	No Action Alternative	Proposed Action	Agency-Mitigated Alternative
Fisheries	Under the existing exploration license, processing operations may cause fluctuations in pond water levels, but impacts to fisheries would be minor. Impacts to fisheries would be linked to potential impacts to groundwater and surface water as described above. Nitrogen compounds could enter water bodies and affect aquatic systems.	The level of impact to fisheries at the Alder Gulch site would increase in duration, and may increase slightly in intensity as the rate of water use for processing increases and is expected to continue for 37 years. Impacts to fisheries would be linked to potential impacts to groundwater and surface water as described above. The lined, water recycling ponds will not contain fish.	Impacts to fisheries would be linked to potential impacts to groundwater and surface water as described above.

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Acronyms and Abbreviations

Acronym	Definition
AADTs	Annual Average Daily Traffic
ACOE	Army Corps of Engineers
amsl	above mean sea level
ARM	Administrative Rules of Montana
BACT	Best Available Control Technology
CARB TM 435	A specialized method used for testing asbestos content in the serpentine aggregate storage piles, on conveyer belts, and on covered surfaces such as roads, play-yards, shoulders and parking lots.
CO	carbon monoxide
dB	decibels
dBp	unweighted peak decibels
DEQ	Department of Environmental Quality
DEQ-AMRB	Department of Environmental Quality Air Resources Management Bureau
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
gpd/ft²	gallons per day per square foot
gpm	gallons per minute
GWIC	Groundwater Information Center
HAPs	Hazardous Air Pollutants
Hz	hertz
IOS	International Organization for Standardization
IPaC	Information, Planning, and Conservation System
km	kilometers
KOA	Kampgrounds of America
L₉₀	90th percentile-exceeded noise level
LAD	Land Application Disposal

Acronyms and Abbreviations

Acronym	Definition
L_{dn}	A single number that represents the constantly varying sound level during a continuous 24-hour period.
L_{eq}	A-weighted equivalent noise levels
L_{pk}	Instantaneous peak noise level
MAAQS	Montana Ambient Air Quality Standards
MAQP	Montana Air Quality Permit
MBMG	Montana Bureau of Mines and Geology
MCA	Montana Code Annotated
MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MFISH	Montana Fisheries Information System
MFWP	Montana Fish, Wildlife and Parks
mm	millimeter
MMRA	Montana Metal Mine Reclamation Act
MPDES	Montana Pollutant Discharge Elimination System
MSHA	Mine Safety and Health Administration
MSU	Montana State University
MTNHP	Montana Natural Heritage Program
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification Systems
NOAA	National Oceanic And Atmospheric Administration
NOI MTR	Notice of Intent, Motion to Reopen
NO_x	nitrogen oxides
NRCS	Natural Resources and Conservation Service
NSR	New Source Review
NWS	National Weather Service
PM	particulate matter

Acronyms and Abbreviations

Acronym	Definition
pbPb	lead
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RWA	Red Wash Alluvial Site
RWHR	Red Wash Hard Rock Site
SO₂	sulfur dioxides
SPCC	Spill Prevention, Control, and Countermeasures
SSL	Soil Screening Levels
SWPPP	Storm Water Pollution Prevention Plan
TDS	Total Dissolved Solids
TES	Threatened and Endangered Species
TNM	Traffic Noise Model
TPY	tons per year
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VOC	volatile organic compounds

Glossary and Useful Terminology

Term	Definition
Acid rock drainage	Water from pits, underground workings, waste rock, and tailings containing free sulfuric acid. The formation of acid drainage is primarily due to the weathering of iron pyrite and other sulfur-containing minerals. Acid drainage can mobilize and transport heavy metals which are often characteristic of metal deposits.
Agency-Mitigated Alternative	An alternative to the Proposed Action developed in response to impacts or issues identified during scoping
Alluvium	Sand, silt, gravel, and similar materials transported and deposited by water
Amalgam	A substance formed by the reaction of mercury with another metal
Amphibole	Any of a group of complex silicate minerals that contain calcium, sodium, magnesium, aluminum, and iron ions or a combination of them
Amphibolite	A metamorphic rock composed chiefly of amphibole with minor plagioclase and little quartz
Arid	Excessively dry environment, with insufficient rainfall to support agriculture, less than 25 cm (10 inches) of annual rainfall
Arsenic	A metalloid element used to strengthen the alloys of copper and lead. It is poisonous to multicellular life including humans and aquatic organisms
Asbestos	A fibrous silicate material known for its resistance to fire, heat, electrical and chemical damage. It has been banned or restricted in many jurisdictions because it is harmful when inhaled.
Attainment area	An area where the air quality currently meets or exceeds NAAQS primary standards
Bedrock	Solid rock underlying the soil or other unconsolidated material
Biotite	A black to dark brown or dark green mineral in the mica group that forms in crystalline rocks. The mineral is in the mica family.
Channery	An accumulation of thin, flat, coarse fragments of sandstone, limestone, or schist with diameters up to 6 inches
Chlorite	A mineral group of platy greenish minerals found in igneous rocks, often as a product of rock alteration
Chromium	A hard, corrosion resistant mineral that often occurs in contact zones between rock types
Coarse grained	A particle size measuring between 0.5 and 1 mm

Term	Definition
Colluvium	A term used to describe loose mass of soil material and or rock fragments deposited by process of weathering
Competent rock	A volume of rock with a set of criteria that allow it to support tectonic force.
Crystalline bedrock	A term used to define an igneous or metamorphic rock rather than a sedimentary rock
Dredge	Excavation completed at least partly underwater, or the machine used to excavate underwater
Effluent	Outflow of water (or another liquid) from a natural body of water or from a manmade structure
Ephemeral	A stream that flows seasonally for a short period
Fleet ready line area	An area near the entrance of the pit to provide parking, maintenance, and storage of trucks and equipment
Fugitive emissions	Leaks of gases or vapors from pressurized equipment that are unintended
Gaining stream	A stream that gains water from the saturated zone as it goes downstream
Garnet	A group of silicate minerals that form in igneous and metamorphic rocks. They are used as semiprecious stones and as abrasives.
General Mining Act of 1872	A US law that governs prospecting and mining for economic minerals on federal public lands
Groundwater gradient	The direction that water flows beneath the ground's surface
Hydraulic conductivity	Rate at which groundwater moves through porous media
Hydric soils	Soil formed under conditions of saturation, flooding, or ponding
Hydrophytic vegetation	Plant life that thrives in wet conditions
Igneous	A rock type formed through the cooling and solidification of magma or lava
Intrusion	Igneous rock formed within surrounding rock as a result of magma intrusion
Jigging	A process by which ore is separated by specific gravity
Late Cretaceous	A period of geologic time, from 96-74 million years ago
Lava	Molten rock expelled by a volcano during an eruption or the resulting rock after solidification and cooling
Loam	A mixture of clay, silt, and sand

Term	Definition
Lode mining	Mining of a mineral deposit that was deposited in veins within a rock
Losing stream	A stream that loses water to the ground as it goes downstream
Magma	A mixture of molten or semi-molten rock, volatiles and solids that is found beneath the surface of the Earth
Manganese	An element often found in combination with iron. It is used to improve the strength, stiffness, hardness, wear resistance, and hardenability of steels and other industrial uses. It is an important trace element in nutrition, but it can be toxic to organisms in high quantities.
Metamorphosed	Rock altered by naturally occurring heat and pressure in the earth's crust
Migratory Bird Treaty Act	A treaty passed in 1916 between the US and Canada for the protection of migratory birds. Now includes the US, Mexico, Japan, and Russia.
Migmatite	A rock found in medium to high grade metamorphic areas
Molybdenum	A transition metal element with a high melting point. It is used in forming steel alloys.
Montana Water Quality Act	This act asserts the primary basis for water quality in Montana and provides the authority to implement surface and groundwater standards.
National Historic Preservation Act	Signed into law in 1966 in an effort to preserve historical and archaeological sites in the U.S.
Noise Control Act of 1972	The federal program designed to regulate noise pollution in order to protect human health.
Nonattainment areas	Regions which the EPA has designated, by rule, as not consistently attaining National Ambient Air Quality Standards limits
Ore	A mineral or an aggregate of minerals from which a commodity can be profitably mined or extracted
Outcrops	A visible exposure of bedrock
Pegmatite	A coarse grained igneous rock usually found in dikes, lenses or veins
Pit highwall	Steep rock surfaces bordering a pit after removal of ore and waste, or the working face of the pit
Placer mining	Mining of alluvial (water deposited sediments) deposits for minerals
Point source	A single identifiable source of pollution

Term	Definition
Precambrian	An era of geologic time, from approximately 3.8 billion years ago to 570 million years ago
Quaternary	Geologic time period from 1.5 million years ago to present
Quartzo-feldspathic gneiss	A rock formed by metamorphosis of either silica-rich igneous or sedimentary rocks
Redox	The tendency for transfer of electrons from one compound to another. The donor is oxidized, the acceptor reduced
Residuum weathered	The components left over by the weathering processes
Rhizosphere	The narrow region of soil that is directly influenced by root secretions and associated soil microorganisms
Rookery	A communal nesting ground for gregarious birds consisting of anywhere from just a few nests to hundreds of nesting pairs
Schist	Shale that has undergone metamorphosis. Recognizable by the foliation or laminated layers
Sedimentary	A rock formed by the deposition of material on the surface of the earth and within bodies of water
Selenium	A grey non-metallic mineral that is toxic to aquatic organisms at elevated concentrations
Shrub-steppe	A type of low rainfall natural grassland characterized by dry-adapted shrubs and grasses
Silica	A chemical compound that is an oxide of silicon with the chemical formula SiO_2 and is the main constituent of most of the earth's rocks. Also known as silicon dioxide.
Spiral	In mining, a machine used for physical separation by centrifugal force
Strata	Multiple sheet like layers of sedimentary rock that are visibly separable from the layers above and below
Substrate	The substance, base, or nutrient, or other material on which an organism lives and grows
Sulfides	A mineral composed of sulfur combined with a metal or semi-metal, for example pyrite
Sump	A space the collects any liquids and drainage water
Swales	A tract of land, especially one that is moist or marshy. Can be natural or human created
Tailings	Refuse or waste rock remaining after ore has been processed

Term	Definition
Talc	A very soft mineral that is a basic silicate of magnesium
Upland montane sagebrush steppe	Occurs on deep-soiled to stony flats, ridges, nearly flat ridge tops, and mountain slopes and is dominated by sagebrush
Water Protection Bureau	A division of DEQ designed to prevent surface and groundwater pollution by reviewing potential sources of pollution and issuing permits for pollutant discharges
Wet plant	Processing of garnet ore with the aid of water
Whole rock geochemical analysis	Analyzing all the different parts of the rock to determine what exists in the rock

Chapter 1: Purpose and Benefits of the Proposed Action

1.1 Introduction

The Department of Environmental Quality (DEQ) has received an application from Garnet USA, LLC (Garnet USA) to amend Operating Permit No. 00157. The purpose of the proposed amendment is to allow Garnet USA to mine garnet ore at a new site known as the Red Wash Hard Rock (RWHR) site. Hard Rock Operating Permit No. 00157 currently covers a mine and processing plant at the Alder Gulch Mine site, located approximately one mile east of Alder, Montana (Figure 1.1-1), and the Red Wash Alluvial site, which previously has been mined and reclaimed. The proposed permit area boundaries for the project are shown in Figure 1.1-2.

1.2 Garnet USA Mine Background

Operating Permit No. 00157 was initially issued to Cominco American Resources Incorporated in 1995. The operating permit provided for mining and processing of garnet from the alluvial deposits within the 511 acre permit boundary surrounding the Alder Gulch Mine site.

Historically, the site had been subject to placer mining for gold. Ownership of the Alder Gulch Mine site was transferred to the Montana-Oregon Investment Group (MOIG) in 2000. MOIG sold the operation to Ruby Valley Garnet in September 2004. In 2007, DEQ issued an amendment to Operating Permit No. 00157 allowing Ruby Valley Garnet to mine an alluvial deposit at the Red Wash Alluvial (RWA) site, approximately three miles from the Alder Gulch Mine site. Materials mined at the RWA site were transported to and processed at the Alder Gulch processing facility. The RWA site was mined from 2007 to 2010 when it was reclaimed.

Garnet USA purchased Ruby Valley Garnet in November 2011. In January 2012, Operating Permit No. 00157 was transferred to Garnet USA. Garnet USA amended Exploration License No. 00642 to continue exploration at the RWHR site in early 2013. The exploration license allows for Garnet USA to conduct drilling, trenching, and removal of a 10,000 ton bulk sample of ore from the RWHR site for testing and evaluation. Materials removed under the exploration license are processed at the Alder Gulch processing facility under the operating permit.

1.3 Montana's Hard Rock Mining Permitting Process

The DEQ Hard Rock Program regulates the mining of all ore, rock, or substances except oil, gas, bentonite, clay, coal, sand, gravel, peat, soil materials, and uranium. It is the Hard Rock Mining Program's responsibility to issue timely permitting decisions under the Metal Mine Reclamation Act. In addition, the permitting process ensures appropriate public involvement through compliance with the Montana Environmental Policy Act (MEPA).

Once DEQ receives an operating permit application, the agency reviews it for completeness and compliance with the substantive requirements of the MMRA. DEQ may request additional

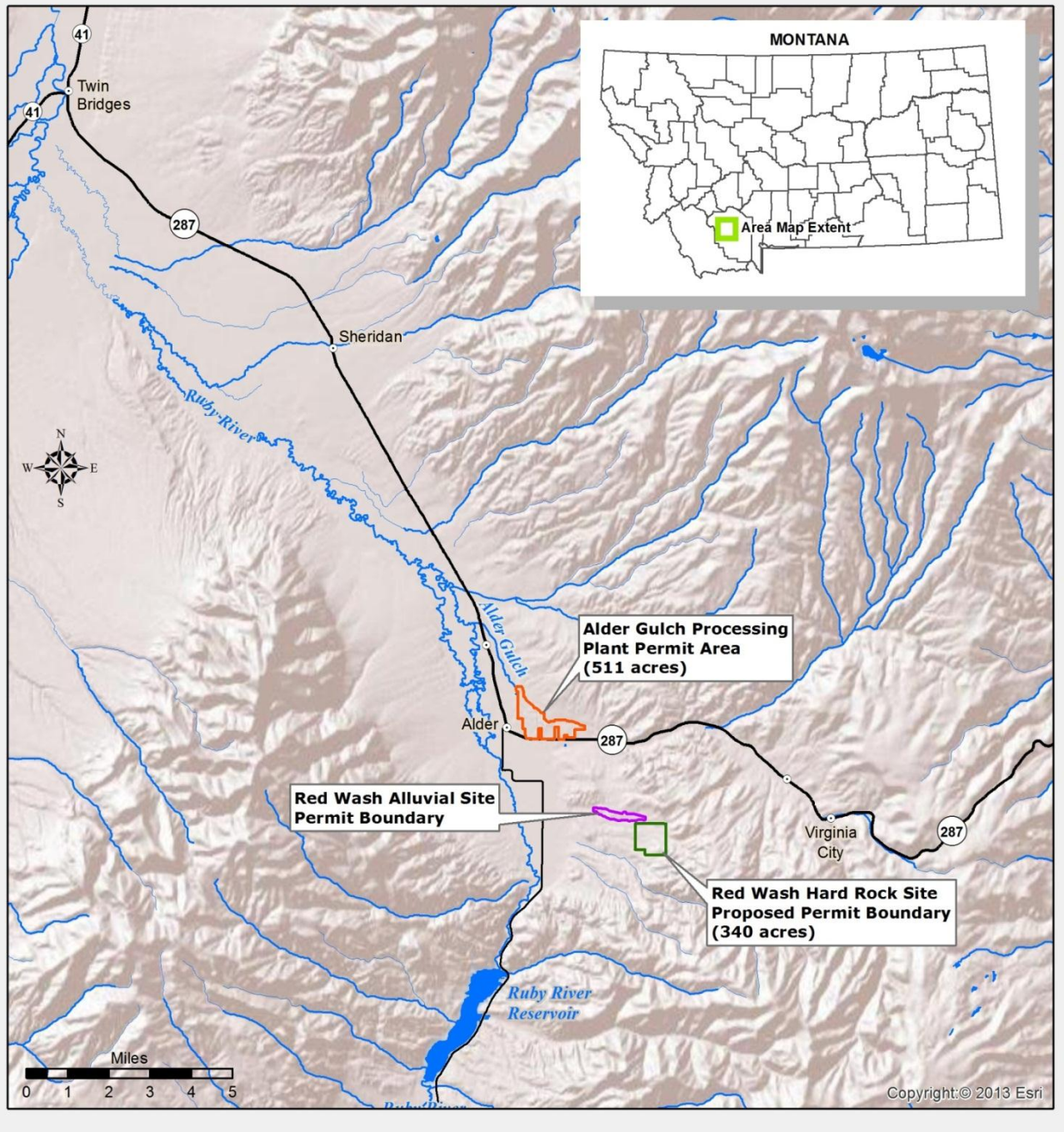


Figure 1.1-1. Project Area for the Proposed Garnet USA Operating Permit Amendment, Madison County, Montana.

information or modification of the permit application in order to deem it complete or to bring the permit application into compliance. If DEQ is able to determine that the permit application is complete and compliant with the substantive requirements of the MMRA, the agency issues a draft permit. Issuance of the draft permit as a final permit is the proposed state action that is the

subject of this MEPA analysis. An application for a major amendment to an operating permit is processed in the same manner as an application for a new permit.

1.4 DEQ's Responsibilities and Decisions

DEQ administers the MMRA, MEPA, the Clean Air Act of Montana (75-2-101, *et seq.*, MCA), and the Montana Water Quality Act (75-5-101, *et seq.*, MCA). DEQ may approve a permit only if it contains a reclamation plan that accomplishes the requirements and standards set forth in Section 82-4-336, MCA. Subsection 10 of this statute requires reclamation plans to provide sufficient measures to ensure public safety and to prevent the pollution of air or water and the degradation of adjacent lands.

DEQ is preparing this environmental impact statement in order to comply with MEPA. The environmental impact statement will disclose the potential impacts of the Proposed Action, the No Action Alternative, and reasonable alternatives to the Proposed Action. At the conclusion of the environmental review, DEQ will issue a concise public record of decision (ROD). The ROD is a public notice of what the decision is, the reasons for the decision, and any special conditions surrounding the decision or its implementation.

1.5 Scope of the Analysis

The geographic scope of this EIS includes the existing infrastructure related to Garnet USA's Alder Gulch processing plant and proposed mine, the areas within the Red Wash Alluvial Site and the proposed RWHR mine permit boundaries, as well as an alternate road connection with the processing plant (Figure 1.1-2). The EIS presents descriptions of the Proposed Action and alternatives, including the No Action Alternative and the Agency-Mitigated Alternative (Chapter 2); descriptions of the affected environment for all potentially affected resources (Chapter 3); and an analysis of the environmental consequences of the alternatives (Chapter 4).

1.6 Public Involvement Process

One of MEPA's objectives is to ensure that the public is informed of and participates in the review process. The MEPA Model Rules require an agency to invite the participation of government agencies and interested persons or groups in determining the scope of an EIS. A review period is provided to receive comments on the draft EIS. A public hearing on the draft EIS will be held during the review period.

1.7 Issues Identified during Scoping

DEQ opened the scoping period for this EIS on March 26, 2013. On April 16, 2013 DEQ held a scoping meeting in Alder, Montana at the Alder Community Hall. Comments made at the meeting and received via postal mail or e-mail were compiled by DEQ and entered into the administrative record. The scoping period ended on April 26, 2013. DEQ published notices of the scoping period and the scoping meeting in the Butte newspaper, the *Montana Standard*, on

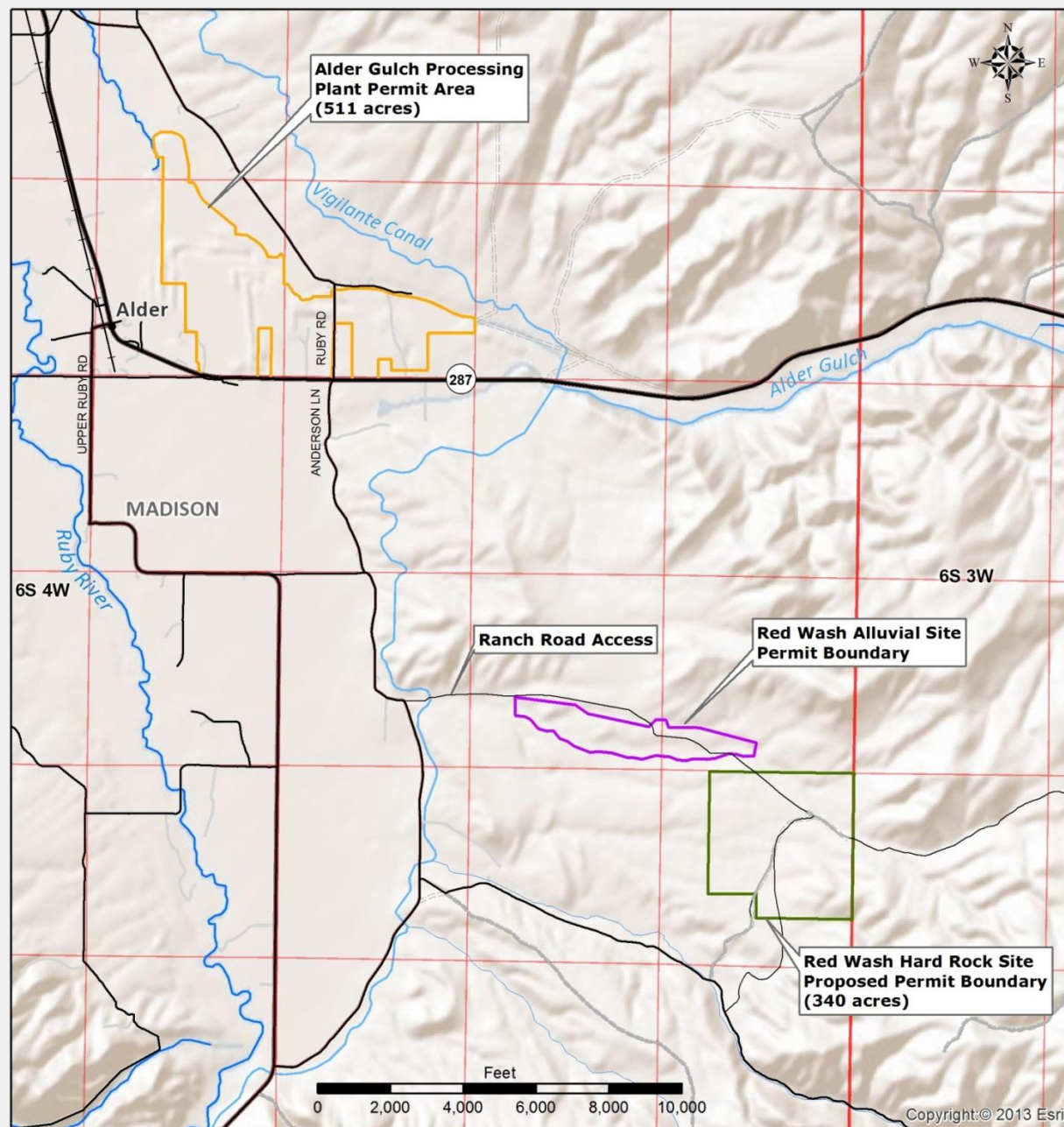


Figure 1.1-2. Permit Area Boundaries for the Alder Gulch Processing Plant, the Red Wash Alluvial Mine Site (reclaimed), and the Red Wash Hard Rock Mine Site, Madison County, Montana.

Sunday, March 24 and Sunday, March 31, 2013 and in the Ennis newspaper, the *Madisonian* on March 28 and April 3, 2013. In addition, DEQ mailed scoping notices to over 150 agencies and individuals who had expressed interest in the project.

The intent of scoping is to solicit participation from the public and interested agencies regarding the direction, breadth, and extent of the analysis contained in an EIS. Comments are evaluated based on their content and relevance, and the jurisdiction of DEQ and associated agencies. Scoping comments may redirect the analysis or assist in development of alternatives.

Fifteen individuals or entities submitted written comments to DEQ during the public scoping period in addition to the comments recorded at the April 16 scoping meeting. The majority of comments were from individual citizens. No comments were received from State or Federal agencies. Several commenters addressed more than one topic or resource area in their submittals. Scoping comments focused on potential impacts related to transporting the ore material from the mine site to the processing plant, the potential for water quality impacts to surface and groundwater, and concerns related to noise and dust produced by the processing plant.

1.8 Issues Considered but Not Studied in Detail

During scoping, the possibility of moving the processing plant from the Alder Gulch Mine site to the RWHR site was put forward by members of the Alder community. Operation of the processing plant at the Alder Gulch Mine site, however, is currently permitted under Operating Permit No. 00157. Garnet USA did not include relocation of the processing plant in its application to amend the operating permit.

DEQ has the authority to unilaterally modify the terms of an existing operating permit only for one of the following reasons:

1. To modify the requirements so that they will not conflict with existing law;
2. When the previously adopted reclamation plan is impossible or impracticable to implement and maintain;
3. When significant environmental problem situations not permitted under the terms of regulatory permits held by the permittee are revealed by field inspection and the department has the authority to address them under the provisions of the Metal Mine Reclamation Act.

None of these reasons exist in regard to operation of the processing plant at the Alder Gulch Mine site.

Because relocation of the processing facility is neither requested by Garnet USA nor within DEQ's unilateral authority, relocation of the processing facility to the RWHR site will not be considered in detail.

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Chapter 2: Description of Alternatives

2.1 Overview

This chapter describes the process of developing and selecting reasonable alternatives to the Proposed Action. To be considered for further analysis, each potential alternative had to meet the purpose and benefits of allowing Garnet USA to pursue extraction of mineral resources from its mining claims, as well as regulatory, environmental, and economic feasibility criteria. In addition, each alternative must be deemed to be reasonable. A reasonable alternative is one that is practical, technically possible, and economically feasible. In most instances, economic feasibility of a Proposed Action is determined solely by the economic viability for "similar projects having similar conditions and physical locations and determined without regard to the economic strength of the specific project sponsor" (75-1-201, MCA).

Alternatives were evaluated and placed into the following categories:

- The No Action Alternative assumes that DEQ would not approve the amendment to Garnet USA's existing operating permit. Exploration actions already approved under Garnet USA's Exploration License and the 1995 Operating Permit and previous amendments would continue.
- The Proposed Action describes Garnet USA's mine plan and their reclamation plan as submitted in its draft Operating Permit amendment.
- The Agency-Mitigated Alternative identifies alternative components that are reasonable and that would support the purpose and benefits of the Proposed Action. The alternatives must also be feasible from a regulatory, technical, and economic standpoint.
- Alternatives considered and eliminated include alternatives or alternative components that were examined but eliminated from detailed study. Alternatives discussed include moving the processing plant to the RWHR mine site.

To facilitate comparison of alternatives, background information is included on Montana's mining laws and existing regulations to provide context on how the State permits mining activities as well as other required permits and environmental standards with which Garnet USA must comply. This review is not exhaustive; rather it provides an overview of the most pertinent laws and regulations. The MMRA is contained in 82-4-300 *et seq.*, MCA; MEPA is contained in 75-1-100 *et seq.*, MCA; Montana Water Quality Act is contained in 75-5-101 *et seq.*, MCA; Montana's non-degradation policy is found in 75-5-303, MCA; and Clean Air Act of Montana is contained in 75-2-100 *et seq.*, MCA. Readers are encouraged to review the primary source material for more complete understanding of the laws and regulations that govern mining and resource policy in Montana.

2.1.1 Development of Reasonable Alternatives

The Proposed Action is a permitting action and would have potential implications for future land use. A comparison of the operations and facilities of the alternatives considered in detail is

provided in Table 2.4-1. A condensed description of the potential impacts is provided in Table 2-9-1. The potential impacts relevant to each resource area are detailed in Chapter 4.

2.2 Project Area

The Garnet USA project has three distinct sites: the existing Alder Gulch Mine and processing plant, the Red Wash Alluvial site, and the proposed RWHR Mine site. The existing and previously permitted Alder Gulch processing plant is located approximately one mile east of the community of Alder, Montana, in the Ruby Valley of southwestern Montana (Figure 1.1-1). Virginia City, Montana is the Madison County Seat and is located approximately nine miles east of the previously permitted site; Sheridan, Montana is located approximately eleven miles northwest. All access, surface facilities, and mining areas are located on privately-owned lands.

As previously approved, the permitted area for the Alder Gulch Mine contains mining sites and a processing facility. The Alder Gulch Mine and processing plant site is contained within Sections 4, 9, and 10, Township 6 South, Range 4 West, in Madison County, Montana on lands that have been disturbed by historic gold placer mining. The Alder Gulch processing plant covers approximately 75 acres and surrounds the Alder Water and Sewer District sewage lagoons and land application disposal (LAD) acreage. The entire processing plant permit area covers approximately 511 acres and includes a historic placer-mined area. A gravel pit operation is located just west and adjacent to the processing plant lands. There are seven private homes east of the site along Ruby Road, and several private land parcels to the north.

Access to the processing facility is provided by Ruby Road, a gravel road that intersects State Route 287, and by a driveway (South Road) that connects directly with State Route 287. No further mining is proposed at the Alder Gulch Mine facility; it would be used as the processing site for garnet-bearing rock mined from the RWHR Mine site, but has the ability to process garnet feedstock from other alternate sources with DEQ approval. It should be noted that mining at the Alder Gulch processing plant is still permitted. Garnet USA may mine it at some future time.

The Red Wash Alluvial Mine site covers portions of Sections 23 and 24, Township 6 South, Range 4 West and has been reclaimed. Although this site remains permitted for mining, no further mining is planned or proposed for the site.

The RWHR Mine site is located approximately three miles southeast of the Alder Gulch processing facility. The RWHR Mine site permit boundary includes approximately 340 acres in Section 25, Township 6 South, and Range 4 West. The RWHR Mine site is less than one-half mile from the now reclaimed RWA site. Access to the RWHR Mine site is via State Route 287 and Anderson Lane, a county-maintained road, to improved ranch access roads that intersect the mine area.

2.3 Existing Approvals

This EIS will focus on the decision to be made related to approving an amendment to Garnet USA's operating permit as submitted in February 2013 (Garnet USA, 2013). Garnet USA holds Operating Permit No. 00157 which has been amended twice since it was issued in 1995.

Garnet USA also holds Exploration License No. 00642 that allows for exploration activities at the RWHR Mine site. Throughout this document it is important to distinguish between activities that have already been approved as part of the 1995 operating permit, the exploration license, and those that are being considered under this EIS as part of the draft operating permit amendment. To clarify, the exploration license allows exploration activities only. This amendment to the 1995 operating permit, if approved, would allow mining to proceed at the RWHR Mine site. The following sections explain some of the approvals that Garnet USA has obtained.

General Mining Act of 1872

The legal right to mine is granted by the General Mining Act of 1872 which authorizes Garnet USA to hold the mineral rights to land affected by the operating permit via patented and unpatented mineral lode and placer claims and to conduct mining on this land.

DEQ Operating Permit No. 00157

The proposed amendment to Operating Permit No. 00157 is a major amendment which must be processed under the MMRA. If approved, this would be the third amendment under Operating Permit No. 00157. The MMRA statute provides a two-step process for DEQ's review of an application. First, a completeness and compliance review must be performed to determine whether the application for amendment contains all the information required by law and satisfies the substantive requirements of the MMRA and its associated administrative rules. If an application is found to be complete and compliant, a draft permit amendment is issued. Second, an environmental review of the application under MEPA is performed. A final permit amendment is issued upon the determination that it meets the substantive requirements of the MMRA and its associated rules and after the submission of a reclamation bond by the applicant. Garnet USA's application was deemed complete and compliant and DEQ issued the draft permit in February 2013.

DEQ Exploration License No. 00642

Garnet USA received an exploration license modification for the RWHR site in February of 2013. Under the exploration program, Garnet USA can construct trenches, drill, and remove a bulk sample of up to 10,000 tons of ore to gain a better understanding of the garnet resource. Exploration findings can assist in mine planning, and may suggest additional technical investigations.

DEQ Air Quality Permits 2888-03 and 4842-00

In accordance with DEQ regulations for operating the processing facility, Garnet USA submitted Air Quality Permit Applications to DEQ's Air Resources Management Bureau. DEQ issued DEQ-ARMB Permit # 2888-03 for the Alder Gulch processing plant in May 2012. A new

application was made in addition to the existing air quality permit to add the crushing circuit and equipment at the RWHR Mine site on November 29, 2012. This modification was revised to include operation initially at the plant as well as include additional equipment and was issued a new permit number. The new permit was assigned #4842-00 and the preliminary determination and proposal to issue a permit was issued on February 13, 2013. DEQ issued DEQ-ARMB Permit #4842-00, which covers the mobile crushing unit to be used at the RWHR site, in April 2013. Both permit #4842-00, covering the crusher and other mobile components, and permit #2888-03, covering the processing plant are in force until revoked (Garnet USA 2013a).

Montana Department of Environmental Quality – Montana Pollutant Discharge Elimination System (MPDES)

Montana Pollutant Discharge Elimination System (MPDES) Permit MT No. 0029971 was issued on November 1, 1997 for the Ruby Garnet Project. The project did not involve the discharge of any pollutants to the surface waters of the State of Montana. This permit was replaced by the Sand and Gravel General Permit, Authorization Number MTG490015 on June 19, 2007. The permit was transferred to Garnet USA, LLC on April 18, 2012. The authorization allowed for the discharge of wastewater under the July 1, 2007 MPDES Sand and Gravel General Permit, MTG490000. The discharge occurs through infiltration of wastewater from three silt ponds to groundwater which is hydrogeologically connected to Alder Creek. The combined discharge to groundwater from the three outfalls must be estimated and reported and cannot exceed 6,000 gallons per minute. In addition, the net turbidity must not exceed 5.0 Nephelometric Turbidity Units above the naturally occurring turbidity of the receiving water and the pH of the discharge must be within the range of 6.0 to 9.0 standard units. Authorization of the permit is issued pursuant to the MPDES program under the authority of 75-5-402, MCA, of the Montana Water Quality Act and Section 402 and 303 of the Federal Clean Water Act.

DEQ General Permit for Stormwater Discharges Associated with Construction Activity

In accordance with DEQ regulations for discharge of storm water from a construction site, Garnet USA submitted a Notice of Intent (NOI MTR) and a Storm Water Pollution Prevention Plan (SWPPP) to the DEQ. This authorizes the project to discharge storm water in accordance with the limitations, monitoring requirements, and other provisions set forth by the General Permit. The SWPPP would be updated as needed to address storm water discharges from any new disturbances proposed under the Operating Permit amendment.

2.4 No Action Alternative

Under the No Action Alternative, DEQ would not approve Garnet USA's operating permit amendment. Garnet USA currently holds Operating Permit No. 00157 and has developed or is using previously developed areas covering approximately 70 acres within the Alder Gulch processing plant permit area boundary. The No Action Alternative assumes that Garnet USA could continue any and all activities approved under its operating permit and exploration license; therefore, the No Action Alternative is a "status quo" approach. The following sections describe what kinds of activities and surface disturbance are currently part of its operating permit and exploration license.

2.4.1 Exploration and Operations

Under the MMRA, "Exploration" includes all activities that are conducted on or beneath the surface of lands and that result in material disturbance of the surface for the purpose of determining the presence, location, extent, depth, grade, and economic viability of mineralization in those lands, if any, other than mining for production and economic exploitation; and all roads made for the purpose of facilitating exploration (82-4-303, MCA). Garnet USA could remove up to 10,000 tons of ore as a bulk sample under their current exploration license. This would provide a project life of less than one year. Ore removed as part of exploration would be processed at the Alder Gulch Mine Site under the current operating permit.

2.4.2 Project Facilities

Garnet USA can process any ore stockpiles, process the exploration bulk ore sample, or process ore brought to the plant from other sources with DEQ approval to its processing plant under its existing permit. Garnet USA can also reprocess dredge tailings under its current operating permit. The existing facilities at the Alder Gulch processing plant are described in Table 2.4-1 and are shown on Figure 2.4-1.

Table 2.4-1. List of Existing, Permitted Facilities at the Alder Gulch Processing Plant, the Acreage Covered by Each Component, and any Proposed Changes to These Facilities Covered Under the Alternatives Under Consideration.

Facility/ Component	No Action Alternative	Current Acreage	Proposed Action	Agency-Mitigated Alternative
Ore stockpiles	Three areas are used for stockpiles	5.8	No changes	Same as Proposed Action
Haul and access roads	Existing roads are on north, south, and east sides of facility to provide access	2.8	New road on west side for access to State Route 287	Realign entrance, construct angle road, retire East Road, extend visibility berm
Ponds	Existing north, west, and east ponds	6.1	No changes	Same as Proposed Action
Wet process pond	Pond used to collect washed non-ore fines from the ore in wet plant and other wet processing activities.	1.0	No changes	Same as Proposed Action
Wet processing plant	Plant uses wet spirals, screens, slurry pumps and other processing methods to process garnet ore.	1.4	Proposed upgrades would remain within current footprint.	Same as Proposed Action
North and South Process Ponds	N/A	N/A	Lined recirculation ponds for process water-4.7 acres	Same as Proposed Action
Buildings	Office, lab, warehouse and packaging plant, dry plant, shop, and fuel facilities	8.2	Additional office building and lab facility in existing 8.2 acre footprint	Same as Proposed Action
Parking	Parking scattered across site at office, shop, and other locations		Creation of dedicated employee parking site to meet MSHA rules on approx. 1.2 acres	Parking accessed via South Road. Parking location and size is the same as under Proposed Action
Boneyards	Areas for miscellaneous parts, equipment, conveyors, and items that need repair or are being stored for future use or re-use in the facilities between office and shop area.	2.7	Existing boneyards would be moved to the north side of Alder Gulch on 2.7 acres.	Same as Proposed Action
Sand stockpile	Sand is separated as part of the wet processing process and is stockpiled on site. It is sold as a byproduct and also used for operational and reclamation	1.9	No changes	Same as Proposed Action

Facility/ Component	No Action Alternative	Current Acreage	Proposed Action	Agency-Mitigated Alternative
	applications on site.			
Crushing area	Portable unit to be operated at the site during exploration adjacent to fleet line ready area. No additional disturbance as a result.	NA	Crusher included as part of Proposed Action at RWHR site.	Same as Proposed Action
Existing Reclaimed areas	Variety of areas used as visual and noise screens along the north, west, and east boundaries of the plant site have been reclaimed.	9.7	Some previously reclaimed areas would be used for road expansion or pond development. A visibility berm will be extended along Ruby Road between the local residences and the processing plant. It will extend as far south as the East Entrance Road.	DEQ recommended extension of visibility berm southward across the East Entrance Road.

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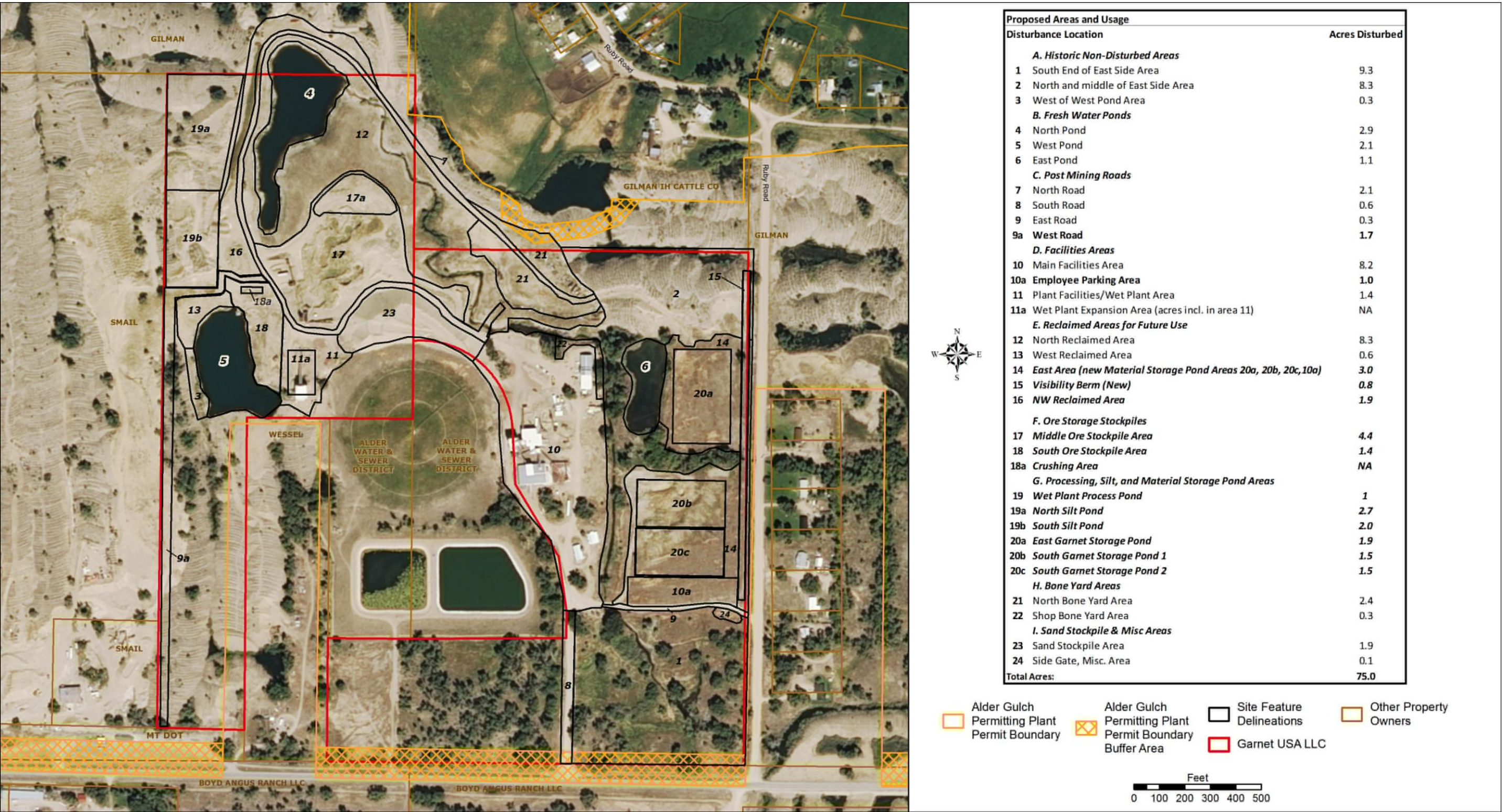


Figure 2.4-1. Existing Facilities at the Alder Gulch Processing Plant and Schematic for Proposed Facility Changes.

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2.4.3 Bulk Sample Handling and Processing

The bulk sample removed under the exploration license would be transported to the Alder Gulch processing plant where it would be crushed. Wet processing of the bulk sample would include washing, grinding, physical concentration, screening, and separation at the wet plant. All concentration procedures would continue to involve physical separation (spirals, jigging, tabling, and/or magnetic) processes and would not involve any chemical processes. The drying and bagging processes would continue as previously approved.

2.4.4 Exploration Water Management

Water used for processing at the Alder Gulch processing plant would be obtained from existing ponds on site. The garnet sand preconcentration and final concentration process would require water for use in the separation of garnet sand and from non-garnet bearing materials. Water used during the garnet sand concentration process would be obtained directly from the existing ponds. Water used during the garnet concentration process is directed back to the existing ponds, allowed to settle out fine sediments, and pumped back for use in the processing plant. Water from freshwater ponds would be used to make up evaporation and operational losses.

Potable water would be obtained from a shallow groundwater well located adjacent to the processing facilities. Potable water from the facilities' washrooms would return to the groundwater system through the on-site septic system.

2.4.5 Personnel and Utilities

Employment

Garnet USA anticipates employing approximately 15 to 20 people to operate the facilities and perform the activities approved under the Exploration License.

Power

Overhead electric power is provided to the Alder Gulch processing plant from an existing 7,200 volt NorthWestern Energy overhead power line nearby. Propane is used for the process dryers and space heating. On-site storage of propane is approximately 18,000 gallons and located adjacent the main processing building.

Telephone service is provided by the existing buried fiber optics line along Ruby Road.

Water and Sewer

Water is readily available from groundwater sources, and two on-site wells were constructed to meet processing and potable water needs. One well is capable of providing 15 gallons per minute to the office and safety buildings. A second well is capable of providing 15 gallons per minute to the change room area of the Wet Process building for bathrooms and showers. Domestic wastewater from washrooms is disposed of in an on-site septic tank and drain field system. The septic systems and drain fields were designed in compliance with Madison County and State of Montana sanitary regulations. A sanitary disposal permit was obtained from the Madison County Sanitarian and the disposal facilities were inspected prior to use.

The septic systems receive a maximum flow of 25 gallons per minute through a 4-inch line to a 1,000-gallon septic tank. Drain-field discharge is from a 4-inch diameter perforated pipe. The septic drain field is immediately adjacent to the temporary settling pond used in the 1990 pilot plant operations, and is in the same flat tailings material excavated for the 1990 settling pond. Percolation and water table measurements from the 1990 settling pond showed that to accommodate 25 gallons per minute of discharge, the drain field requires less than 400 linear feet of 4-inch perforated drainpipe (at 1.05 ft² per linear foot of pipe), and was installed out in an area approximately 100 feet by 40 feet.

2.4.5 Transportation

All roads are shown on Figure 2.4-1. The existing Ruby Road runs northward from State Route 287 and is used for access and ore hauling to the main processing and support facilities. Ruby Road has a travel surface width of about 30 feet. The East Road to the processing plant turns off of Ruby Road and was used to haul ore from Red Wash Alluvial site. The East Road is 30 feet wide and was built on regraded tailings.

The original South Road which is still used for access and deliveries from the warehouse runs north off of State Route 287 directly to the office and warehouse area.

Employee parking is adjacent to the office building, at the shop, and other areas on site.

2.4.6 Reclamation

The original Alder Gulch Mine and processing plant sites are located on previous placer dredge-mined lands that are privately-owned. These lands were mined prior to the establishment of mining reclamation laws in Montana, and as a result, were not subject to reclamation activities. The current unreclaimed nature of the Alder Gulch permit area as well as surrounding properties in this region has significantly reduced the productivity and usefulness of the land. Past historic mining within the permit area has resulted in the disruption of the historic Alder Gulch Creek stream channel, and has left an area characterized by barren dredge tailings piles, sparse vegetation, and limited soil.

The reclamation associated with the operating permit activities at the Alder Gulch site beginning in the 1990's provided for the establishment of new surface contours and vegetation, including a reconstructed stream channel for a segment of Alder Gulch Creek. Backfilling, recontouring, top coating with soil fines, and seeding were concurrent with ongoing mining of the tailings piles.

Much of the reclamation plan for the Alder Gulch Mine site has been permitted and approved previously.

2.4.7 Post Mining Land Use

The main processing facilities and support facilities would remain post-mine for future industrial land uses, no soil replacement following disturbance is proposed. Garnet USA is the owner of lands affected by the main processing facilities and support facilities and will propose which structures will remain at the completion of the project.

In general, lands outside of any proposed industrial use would be graded and revegetated with the proposed upland vegetation species mix. A minimum of six inches of soil fines and silts will be laid down to provide a growth medium on any reclaimed lands. Specific reclamation practices for other lands and facilities within the Alder Gulch Mine permit area are described below. Areas along Alder Gulch would be reclaimed as riparian areas with a different seed mix.

2.4.8 Site Facility Removal

The main processing facility and support facilities would remain functional through the life of the project. The office trailer and repair shop would remain after mine closure. Operation of the facilities would seek to minimize the area of disturbance. Disturbed areas are regraded and a minimum of six inches of fines and silts, sourced from the settling ponds at the Alder Gulch processing plant, will be used to provide a growth medium.

Fuel Storage Facilities

Fuel storage facilities would be salvaged and removed following completion of mining and reclamation activities or when no longer needed. Prior to regrading, soiling, and seeding with the approved seed mix, the area would be inspected for contamination associated with fuel or other petroleum product spills. Any soil with potential contamination would be removed to an appropriate off-site disposal area before reclamation.

Equipment Yard and Contents

All equipment previously stored or located within the equipment yard would be salvaged and removed from the project site. The site would be regraded and revegetated as described above.

The 50-ton storage bin and conveyor associated with the ore stockpile and main processing facility would be salvaged and removed from the project site at the completion of processing activities. Areas disturbed by the operation of these facilities would be reclaimed using the same grading, soiling, and revegetation procedures described above.

2.4.9 Alder Gulch Processing Plant Site Reclamation

Almost all of the reclamation for the Alder Gulch processing plant site has been permitted and approved previously. The following sections describe the reclamation planned for after garnet ore is no longer processed at the Alder Gulch facility.

Topography and Vegetation

Areas would be regraded as necessary before soil spreading. Compacted areas would be ripped with a dozer or grader to at least a depth of 12 inches prior to resoiling. Stockpiled soils or settling pond fines would be spread six inches deep. Once the soil has been placed, areas would be ripped with a dozer or grader to at least a depth of 12 inches prior to reseeding. Areas would be seeded with an approved seed mix.

Ponds and Stockpiles

Following completion of the project, and final removal and salvage of silts and clays (fines) from the settling ponds, the pond would be backfilled to the original contours. The backfilled ponds

would be graded and revegetated with the proposed upland vegetation species mix. The area of the settling pond fines stockpile would be graded and revegetated.

Roads

All access roads to the Alder Gulch processing plant would remain for future industrial use. Other internal roads may be regraded and reclaimed after review by DEQ with the permittee.

2.5 Proposed Action

The Proposed Action would allow garnet mining at the RWHR site, adding 340 acres to the mine operating permit area. About 213 acres would be disturbed over the life of the RWHR Mine. Approximately one-third of the total RWHR acreage proposed for amendment (127 acres) would remain undisturbed.

2.5.1 Mine Operations

The mining plan for the RWHR Mine site is to extract garnet-bearing rock using standard quarry mining methods. Soil would be stripped only in the places intended to be disturbed in specific areas at a time and stockpiled in separate piles south of the pit. The upper weathered zone of the deposit would be ripped using a dozer until competent rock is encountered. Figure 2.5-1 shows the mine facilities and arrangement.

Topsoil in the areas to be disturbed would be pushed downhill and used as erosion control berms or loaded and trucked to soil stockpiles. Overburden at the ore storage pile and crushing areas would be pushed from the eastern pit edge toward the west creating a flat working area at approximately the 5,675 feet elevation above mean sea level (amsl). This would create a bench near the pit entrance that would remain until the pit excavation reaches that elevation.

Actual mining would commence in and around the fleet ready line area, where trucks would be staged for loading, as well as the crushing and screening areas on the western portion to the extent necessary to create the needed flat working areas. The fleet ready line area would be excavated as far down as the pit floor of 5,650 feet amsl. Further excavation may take place as additional ore is found. This would require a revision to the operating permit. Other activities would focus on excavating access roads while mining the eastern portion of the RWHR site by drilling and blasting until the northern line of Section 25 is encountered, or the rock does not contain ore-grade garnet. Mineable garnet resource is not anticipated in the crushing area; this area would not likely be excavated below the original 5,675 feet elevation.

The mining plan includes the excavation of the southwest corner where the sump would be located as the pit extends to lower elevations. Mining benches would typically be 10 feet in height and would run in a winding south-north direction. The 10-foot benches would be mined stepwise from the top to the pit floor. Explosives would be used to break up the rock. Blasted material would be moved by front end loader and dozer, and then transported to the crushing area where it would be stockpiled and fed into a crushing circuit. An ore dump adjacent to the

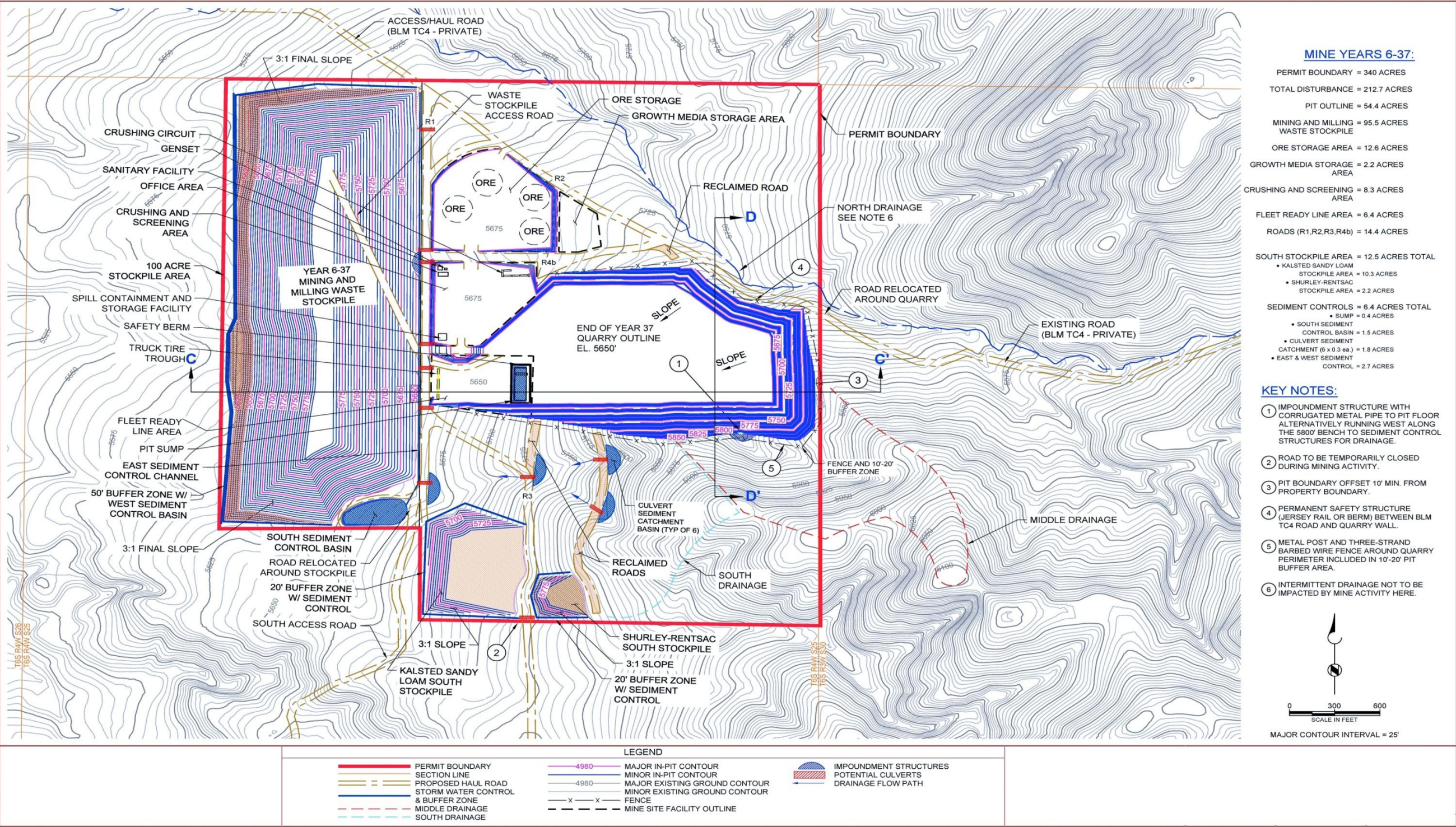


Figure 2.5-1. Proposed Conceptual Mine Topography for the Red Wash Hard Rock Mine at the End of Year 37.

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sump would facilitate the handling of ore directly onto a grizzly screen and would reduce use of a front end loader to feed the crushing circuit.

Actual mining depth has been estimated to extend approximately to elevation 5,650 feet. This would result in a virtually flat pit bottom. However, a minor slope would be maintained to direct storm water to the sump. Drainage from the sump and the mine pit floor would leave the pit area and flow to the south sediment control basin and/or the long west sediment control basin at the lower slope of the mining and milling waste rock stockpile.

The 100-acre waste rock stockpile area would be located west of the area proposed to be mined. Stripped soil would be stockpiled separately and redistributed during reclamation. Figure 2.5-1 shows the proposed RWHR permit boundary, proposed permitted disturbance, access roads, soil and waste rock storage areas, storm water control structures, as well as conceptual mine topography at the end of mine life. The waste rock would initially be deposited in the middle of the stockpile area in sections for each year of deposit. The waste rock would be packed in lifts typically running from the downhill west end working up to the east end along the road. The northern section would likely remain undisturbed for the first six years as shown, while the first lift of the stockpile would be leveled out at about 5,660-5,670 elevation. The North-South stockpile access road running the length of the eastern boundary of the mining and milling waste stockpile would be at the 5,660-5,650 elevation during the life of the mine to allow drainage from the pit and facilitate construction of a sediment control basin for mine pit overflow if needed.

The estimated mine life for RWHR would be approximately 37 years, based on a proposed production rate of about 500,000 tons of ore and waste per year. Mining would take place on a seasonal basis and material would be stockpiled for winter processing at the plant site. The mine is projected to produce 50,000 tons per year of finished garnet product. Surface mining operations may be suspended during adverse winter and spring weather conditions and possibly during extreme dry summer periods. It is possible that the mining operations are continued year round at the mine site with redirecting workers during winter storm events as needed. The plant would run year-round.

Dozers, loaders, excavators, and track drills would be used to strip soil, rip weathered rock, and drill and blast waste rock and garnet-bearing material. A wheel loader or excavator would load a haul truck to transport garnet-bearing ore to the crushing circuit. Crushed product would then be trucked to the Alder Gulch processing facility.

2.5.2 Project Facilities

Approximately 213 acres of the proposed RWHR acreage would be disturbed, and would encompass a pit, waste rock stockpile, ore storage area, growth media storage area, crushing and screening area, roads, fleet ready line area, soil stockpile areas, and sediment control areas.

Garnet USA estimates that the disturbance that would result from mining at the end of pit life would be about 54 acres. The amendment provides that at the end of pit life, the pit would have

reclaimed rock slopes on the southeast and northeast corners, raptor and bat habitat, and revegetated flat benches reclaimed with soil and seeded. A description of the estimated disturbance is provided below.

- Waste rock stockpile: The stockpile area would be located west of the mine pit and proceed north and south as the excavation proceeds. Garnet USA estimates that the total disturbed area at the end five years would be about 41 acres. At the end of the projected mine life (37 year) the total disturbed area would be about 95.5 acres. The design calls for placing the first layer up to the 5,650 elevation even with the floor of the pit and protecting the perimeter with berms and sediment control features.
- Ore storage area: Garnet USA estimates that the ore storage area would be about 12.6 acres and located at 5,675 feet elevation to facilitate easy access for ore haulage. During pit operation it would be graded flat with berms for safety and water runoff control. At the end of pit life, the area would be reclaimed.
- Crushing and Screening area: Garnet USA estimates that about 8.3 acres would be used for the crushing and screening area. This area would be located between the pit and the waste stockpile and excavated to the same elevation as the ore storage area. The crushing circuit equipment is compact, so the rest of the land would be available for staging and stockpiling as needed.
- Growth media storage area: Garnet USA estimates that the growth media storage area would be about 2.2 acres and other than temporarily holding some of the stripped vegetation and soil during the first excavation passes, would be undisturbed. The stripped vegetation and soil stockpile would grow and shrink depending upon excavation and concurrent reclamation activities.
- Roads: Garnet USA estimates that about 14.4 acres would be used for roads related to the RWHR pit activities, such as moving materials to the soil stockpiles, crushing and screening area, and hauling ore to the Alder Gulch processing plant.
- Fleet ready line area: This area would be excavated flat at the 5,650 feet elevation at the base of the pit and provide an area for trucks and equipment to be parked, maintained, or stored. Garnet USA estimates that the disturbed area would be about 6.4 acres.
- South soil stockpile areas: This area would store two soil types from the steeper and shallower slopes in separate stockpiles. Garnet USA estimates this stockpile area would cover about 12.5 acres. The stockpiles would change in size depending upon excavation and concurrent reclamation activities.
- Sediment control areas: Garnet USA estimates that depending upon pit excavation and road locations, about 6.4 acres would be disturbed for sediment and stormwater control structures.

2.5.3 Ore Handling and Processing

The function and use of the processing plant at the Alder Gulch site would remain the same as under the existing permitted activities. However, in order to facilitate mining at RWHR and processing of the higher grade ore, the amendment would include upgrades to the Alder Gulch processing plant processing plant and facilities including:

- The reconfiguration of the North Road to eliminate 8,000 feet of travel through and around processing areas;
- Construction of the West Road to reduce amount of haul truck use on East Road, to allow grading and reclamation of historic placer piles and to create a berm along the western property line. The West Road will allow truck traffic to follow a loop road path to access State Hwy 287;
- Abandonment of wet plant processing pond in the center of the ore storage area;
- Improvements in processing plant;
- Establishment of dedicated employee parking area at the east entrance;
- Establishment of visibility berm along the Ruby Road property line to shield view of storage ponds, parking and plant activity. The berm would extend to a point just north of the East Entrance off Ruby Road;
- Changes in screening and crushing equipment sizing/types;
- Relocate bone yard area; and
- Installation of 2 new lined processing ponds.

A new “Wet Plant Expansion” would be built along with a relocated process pond. The equipment would be installed adjacent to the existing wet plant facility. The Wet Plant Expansion would provide critical processing capacity that complements the current wet plant functionality and would increase processing capacity in a current production bottleneck. Organizational improvements to processing and material handling as well as equipment upgrades would be likely to increase the plant efficiency and throughput.

2.5.4 Mine Water Management

Water management at the RWHR site would include water used for operations and maintenance of the mine, and structures and practices related to control of runoff to reduce sedimentation and erosion. Water management at the Alder Gulch processing facility related to the activities under the Proposed Action would be modified using process ponds constructed with synthetic liners.

Water used for processing at the Alder Gulch processing plant would be obtained from existing ponds on site. Garnet USA has water rights to provide sufficient water for processing. The garnet sand preconcentration and final concentration process would require water for use in the separation of garnet sand and from non-garnet bearing materials. Water used during the garnet sand concentration process would be obtained directly from the active mine pond (silty water), from nearby surface water (existing ponds), and from the plant site recycle pond. Water used during the garnet concentration process would be directed back to the lined North and South process ponds, allowed to settle out fine sediments, and pumped back for use in the processing plant. Water from freshwater ponds would be used to make up evaporation and operational losses.

Water Supply

Drilling and dust control at the RWHR Mine site would require water. Water would be pumped from the downslope sediment pond or trucked in from the Alder Gulch processing facilities. A

40,000 gallon water tank could be installed at a future date. A water truck would be used to control dust. The RWHR crushing and screening circuit would not require water for operation.

Potable water would be transported daily as needed to the RWHR site from the Alder Gulch processing facility.

Stormwater Management

Sediment control structures are planned to divert any possible surface runoff from above the proposed pit during mining activities. The downslope sump area surrounded by berms would be constructed before any mining disturbance occurs. An upstream water control structure with piping to the pit floor would be constructed to divert runoff past the pit highwall and direct any flows toward the sump. The pit floor would be maintained to slope toward the sump to prevent any ponding, and the pit floor would be excavated to daylight as shown for each section.

All of the working areas including the pit itself, the ore storage area, crushing area, fleet ready line and each road have been designed to incorporate substantial berms and buffer zones that include sediment control features. The soil storage stockpiles and the mining and milling waste stockpile have sediment control features as well as buffer zones to keep material or water runoff from leaving the proposed permit boundary. The roads that access the storage piles have culverts and catchment basins added to create places where water flows are controlled and overflows are directed to each of the next control features downhill. All stormwater runoff would culminate in the south sediment control basin which covers 1.5 acres on a fairly flat slope below the disturbed mining areas.

The 1.5 acre west sediment control basin captures the flow off the slope of the waste rock pile as well as overflow from other sediment control structures. At an 8-foot average depth, the west basin would hold over half a million cubic feet – almost as much as the 1.5 acre south sediment control basin.

2.5.5 Personnel and Utilities

Employment

Garnet USA anticipates employing around 60 people to operate the facilities and perform the activities at the proposed RWHR Mine site. This workforce includes the 15 to 20 people employed during the operations under the exploration license (See Section 2.4.5). The potential for indirect or associated employment changes is addressed in Chapter 4.

Power

Power would be provided to the proposed RWHR Mine site by a diesel powered generator. No telephone communication is available at the RWHR Mine site. Communication at the RWHR Mine site would be through cellular service and two-way radios.

Water and Sewer

The proposed RWHR Mine site is dry. Several small seasonal seeps occur in a drainage north of the mine permit boundary. A stockwater pipeline runs along the western edge of the mine area. The contractor may need to relocate the pipeline upon initiation of construction depending

on construction and activity in that location. All potable water would be trucked to the RWHR site as needed.

Sewage at the RWHR site would initially be handled by the use of portable toilets which would be leased and serviced by an independent licensed contractor. Sewage would be removed and disposed of by the contractor in a manner consistent with state and federal regulations.

A temporary office trailer and/or a lunch room may be brought to the RWHR site. If this occurred, then domestic wastewater and sewage would be disposed of in an on-site septic holding tank for periodic pump-outs. All domestic water and septic systems would be designed in compliance with Madison County and State of Montana sanitary regulations. A sanitary disposal permit would be obtained from Madison County's Sanitarian and the disposal facilities inspected prior to use.

2.5.6 Transportation

The proposed main access route to the RWHR site would be along Anderson Lane to an improved and existing ranch access road. The contractor would maintain and grade the road as necessary to ensure safe travel of all personnel. Unimproved "interior" access roads would be constructed with on-site material to provide access between active mine areas and the crushing circuit. Soil would be stripped first and stockpiled before surfacing. The location and life of these roads would vary annually based on advancement of the mining operations. These roads would generally have a surface travel width of 35 feet to safely accommodate mining-related traffic. Based on the proposed equipment, road grades would be held to 10 percent or less as a standard.

Garnet USA's employees would stage at a designated parking area within the Alder Gulch processing facility and carpool to the RWHR Mine site. The parking area would be surfaced with clean gravels obtained from the mining operation.

Employees and vendors would enter and exit the plant site along the South Road (located directly south of the office and shops). Under the Proposed Action, ore haul trucks travel from the RWHR Mine site to Anderson Lane, cross State Route 287 onto Ruby Road, then turn west into the plant on the East Road. The crossing from Anderson Lane to Ruby Road is not fully aligned and requires the haul trucks to deviate slightly to the east. The Proposed Action allows Garnet USA to construct and use a road along the far west plant boundary for the empty ore trucks to exit the plant. This West Road may or may not be built or used. The construction of that road would be contingent upon the needs of the plant and would depend upon permissions and permits to cross State of Montana right-of-way and access State Route 287.

Sediment and erosion control for the roads would be maintained under good engineering practices. It is likely that improvements would be made by the County or the mining company over the life of the mine to straighten sections and fill in some depressions. If any sections of the private road are proposed to be permanently rerouted, the older track would be reclaimed. First year mining activities would not require any major improvements to the road in order to start mining. Sediment control features would be maintained during any improvements.

Ore mined from RWHR would be transported to the Alder Gulch Mine Site for processing using highway-legal trucks.

2.5.7 Reclamation

Most aspects of reclamation of the RWHR Mine and of altered portions of the Alder Gulch processing facilities would be the same or similar to that required under any alternative under consideration. Therefore, a more complete description of mine site reclamation is provided in Section 2.7 Reclamation Common to All Alternatives.

RWHR Waste Rock Stockpile and Pit Reclamation

All facilities at RWHR, including the Mining and Milling Waste Rock Stockpile and pit, will be regraded and soiled as shown on Figure 2.5-2. The proposed grade for all facilities except the pit highwalls would be 3:1, horizontal to vertical, on average. The grade may be steepened in a natural regrade design, with agency review and approval, in some areas if materials testing indicate that steeper slopes can be incorporated without risk of excessive erosion. Variable slopes would enhance visual appeal and reduce the manmade appearance of the facilities.

Garnet USA intends to maximize the utility of the flat pit safety benches for habitat by seeding after application of 30 inches of soil. The benches would be concurrently reclaimed by placing soil on the flat benches before deepening the pit as excavation continues (Garnet USA, 2013a). The reclamation would be done in a manner to smooth the transition between the steeper rock faces and flat benches to maximize the revegetated area.

The pit highwalls would be structurally competent and reclaimed to rock faces (MCA 82-4-336 (9)(b)). The rock faces in the pit consist of layered metamorphic rock including garnet gneiss, amphibole gneiss, and quartzo-feldspathic gneiss. During the mine life, some portions of the pit highwalls would facilitate the creation of vertical wall habitat on the steeper slopes, shelves, flat benches, and partial backfilling. The majority of the highwalls would be reclaimed to rock faces for wildlife habitat and the benches would be soiled like the pit floor. In the upper pit rock faces, Garnet USA would excavate two cavities to produce wildlife habitat for bats or nesting areas for raptors. Garnet USA would provide a conceptual plan for bonding purposes now and develop a final design once the upper rock face is completed to final grade. Once the highwall is completed, Garnet USA can identify portions of the exposed geology that would provide suitable places for the cavities. Garnet USA would create some vertical portions of the highwall after mining activity is finished. The highwall reclamation would depend entirely on the structure, competence, and safety of the rock that is encountered during mining excavation.

About 10 percent of the pit highwalls would be reclaimed in a different manner than the stable rock face and bench method to reduce the visual contrast with adjacent lands, provided work can be accomplished safely. About five percent of the upper northeast corner highwall and five percent in the southeast corner area would be partially backfilled to create 2:1, horizontal to vertical slopes, covered with rocky soils to reduce erosion, and seeded. This partial backfilling would provide access for wildlife and livestock at the two pit corners as well as a visual break in the horizontal benches. As the vegetation on the benches and pit corners matures, the post-reclamation visual contrast would look like natural rock slopes with breaks which occur

throughout the region. Stormwater retention on the planted flat benches should dramatically increase the plant growth success and enhance the habitat as well as the visual benefit.

Maximizing the revegetated flat pit floor area, and only regrading some portions of the pit highwalls would enhance the utility of post-mine use of the area for the rancher's livestock by maximizing the vegetation produced.

Following backfilling and contouring activities, clean waste sand and recovered silts (fines) will be hauled from the Garnet USA processing plant and nearby settling ponds. The stockpiled soil and recovered silts and fines would be blended and spread over regraded spoil to the approximate premine soil depths. Resoiled areas would be ripped with a dozer or grader to at least a depth of 12 inches prior to seeding.

RWHR Mine Roads

Upon final closure of the mining activities at RWHR Mine site, the ranch roads used for haulage and access would be regraded to a width of less than 20 feet or as directed by the landowner. Gravel used in surfacing parking areas during project operations would stay, as the landowner expects to have a commercial use for the facilities when the mine life is over. As a result, the main access road would not be included in proposed site reclamation. Many temporary interior mine access and haul roads would be used for only one year of mining, and would be sequentially reclaimed as part of annual mining reclamation activities.

Plant Site Processing Ponds

Following completion of project processing activities, the PVC liners lining the plant site processing ponds would be removed. The ponds would be backfilled to near original contour with material excavated and stored in the settling ponds stockpile during the first year of operations. The area would be graded, soiled, and revegetated.

2.6 Agency-Mitigated Alternative

MEPA allows the decision-making agency to propose alternatives to the Proposed Action that would meet the purpose and benefits while reducing or mitigating potential impacts. The Agency-Mitigated Alternative may include changes to some aspects of the Proposed Action while other aspects remain unchanged. This section will focus on alterations to the Proposed Action that DEQ includes because the agency has determined that they have the potential to lessen potential impacts.

2.6.1 Project Facilities

In the Proposed Action, Garnet USA's haul trucks coming from the RWHR mine site travel north along Anderson Lane. They then would cross State Route 287 from Anderson Lane to Ruby Road. These two roads are offset which increases the time the haul trucks spend crossing State Route 287. The trucks then travel south along Ruby Road (passing a row of residences) and turn west onto the East Road to the processing plant. The trucks will unload the ore and return to the RWHR mine site by the same route. The time spent crossing the offset intersection across the highway (Ruby Road and Anderson Lane) and the time spent traveling on Ruby

Road places these large trucks in close proximity with residential and highway traffic. The potential impacts due to conflict between ore haul trucks and local traffic may be reduced if Garnet USA chooses to modify the route of the haul trucks as they enter and leave the plant. Garnet USA would work with the local landowners, Montana Department of Transportation (MDT), and Madison County to straighten the alignment of Anderson Lane with Ruby Road across State Route 287. This more direct crossing would help minimize the time that the trucks spend on the highway and increase the ability of the trucks to see oncoming traffic. Once across the highway and traveling along the south end of Ruby Road, the trucks would turn left and enter the plant site via a new northwest-trending access road that takes the trucks directly toward the main plant area (Figure 2.6.1). Garnet USA would need to design and develop this diagonal entrance and egress road to accommodate the passage of trucks in two directions.

Ore trucks would enter the plant by this route, drop their loads at the ore stockpile area, and exit the plant along the same road to Ruby Road. Depending on the final design, the route of this diagonal ore truck entrance may be on the west or east side of the Alder Creek channel and the road may be built across some small isolated seasonal wetlands that have formed in excavated shallow depressions from previous placer mining activities. The new entrance and road into the plant would remove ore trucks from Ruby Road north of the entrance and isolate them from the residents located further north (Figure 2.6-1).

During scoping, local residents commented that the on-site plant operations' employee vehicles, haul trucks, lights, and noise were a nuisance. To help remove plant-related traffic from Ruby Road and reduce possible conflicts with local traffic, Garnet USA would remove the entrance to the plant on the East Road intersection with Ruby Road. Ore haul trucks would use the new diagonal road discussed above. Visitors, vendors, and employees to the plant would use the South Road. The portion of the East Road just east of the office and shop area would continue to be used to access the parking area and to work in the areas west of Ruby Road, but that road would not connect to Ruby Road.

A berm is proposed along the west side of Ruby Road that would be a visibility and noise barrier to shield the local residences from the plant operations. This berm, as proposed, extends as far south as the current East Road access to Ruby Road. When that plant entrance road is removed, the visibility berm would be extended south across the old East Road entrance as far as needed to block the entrance road and further shield the residents from the plant operations, employee traffic, haul truck traffic, and the associated noise, dust, and light. See the Transportation Section 2.6.5 below.

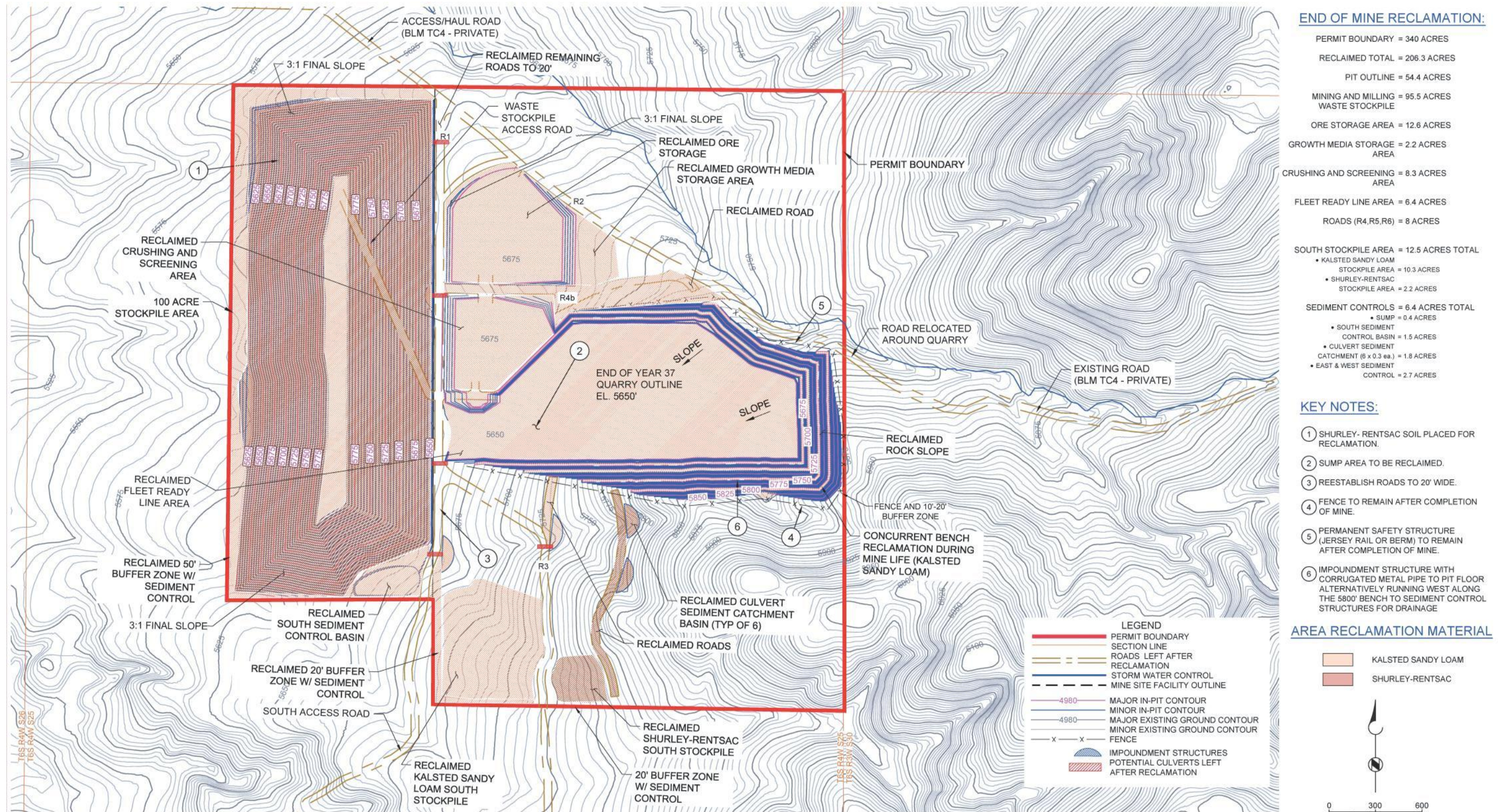


Figure 2.5-2. Proposed Conceptual Mine Topography for the Red Wash Hard Rock Mine after Reclamation.

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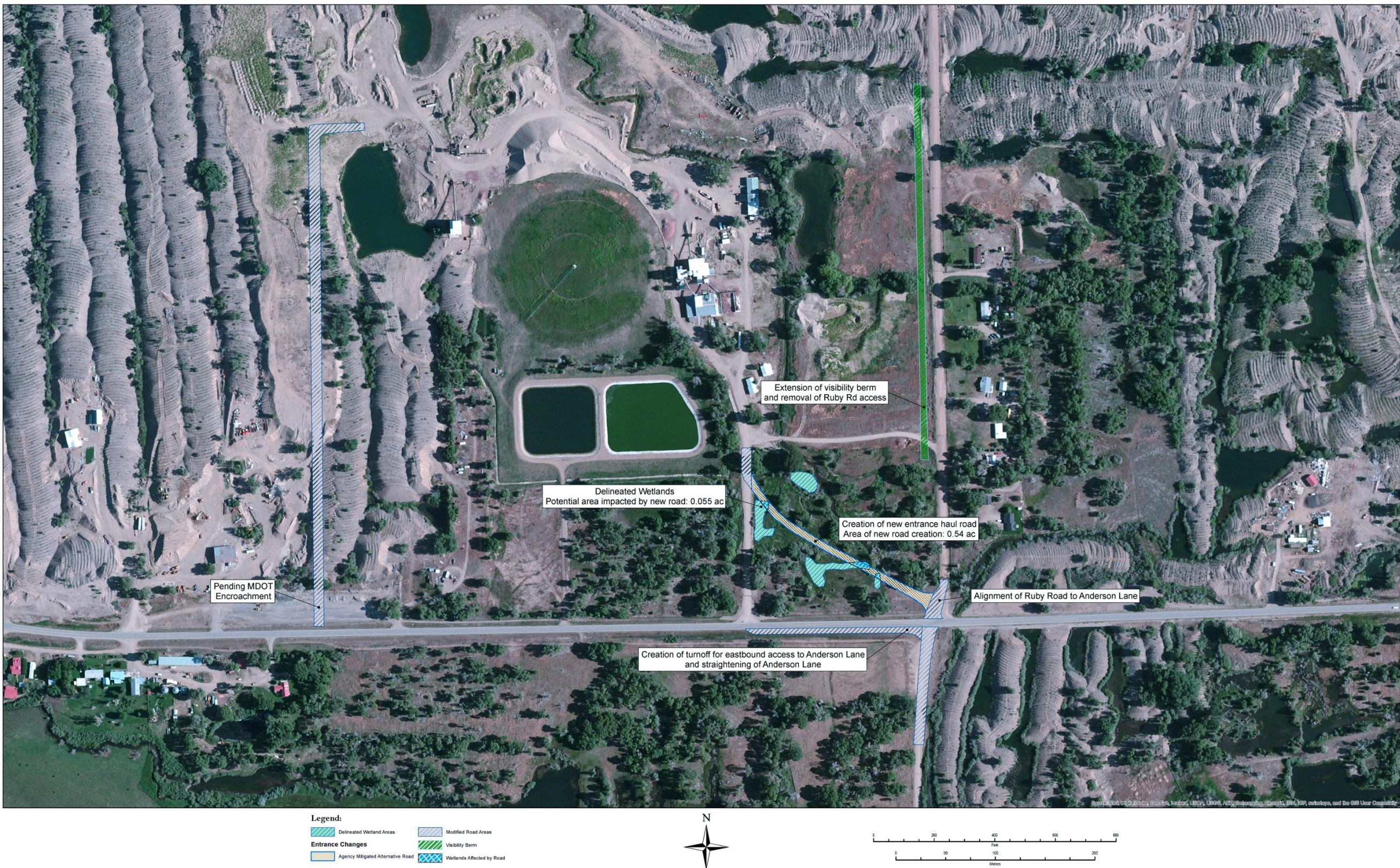


Figure 2.6-1. Proposed Alternative Processing Plant Access Road and Associated Infrastructure for the Garnet USA Project, Madison County, Montana.

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2.6.2 Ore Handling and Processing

There are no proposed changes to ore handling and processing as part of the Agency-Mitigated Alternative other than the changes to the haul route described in Section 2.6.1 and 2.6.5.

2.6.3 Water Management

Nitrogen compounds are common constituents of most commercial explosives used in mining. The Proposed Action would include the use of explosives to break up the rock at the RWHR Mine site and the stockpiling of waste rock and high grade ore. Waste rock would be permanently stored and ore would be temporarily stockpiled at the RWHR site. Ore would also be stockpiled at the plant awaiting wet processing. Nitrogen compounds, if present, could be washed off the ore and waste rock at the RWHR site and at the processing plant. The processing plant would use water to process the ore and garnet concentrate. This water would be sent to two synthetically lined process ponds for later reuse. By design, process water is contained within a closed loop and would not interact with surface water or groundwater. Should the liner fail, there is a potential for groundwater and surface water to be impacted at the processing plant area. Groundwater has the potential to be impacted at the RWHR Mine site in the event that water moving through waste rock encounters groundwater.

The Alder Water and Sewer District, which includes two sewage lagoons and a LAD area, is located within the permit boundary of Garnet USA. It is unclear what impact this facility has on local groundwater. Although outside the scope of this EIS, the location of this LAD will be considered in the proposed groundwater monitoring plan.

Local surface water and groundwater was sampled and analyzed from monitoring locations within the boundaries of the Alder Gulch processing plant before the bulk sample was hauled to the plant site for processing. Nitrogen compounds detected in the surface and groundwater did not exceed water quality standards.

Garnet USA would expand the current groundwater monitoring plan to include more sampling locations and to analyze for nitrate in surface water and groundwater. This expanded monitoring would allow for a broader characterization of baseline water quality conditions, allow a comparison of future water quality compared to current conditions, identify potential leakage from the two lined process ponds, and evaluate if nitrogen compounds are present beneath or migrating from the Alder Gulch site. Garnet USA would also locate groundwater monitoring locations and install monitoring wells at the RWHR site. New groundwater and surface water monitoring locations at the processing plant are shown on Figure 2.6.2. New groundwater monitoring locations for the RWHR site are shown on Figure 2.6.3.

2.6.4 Personnel and Utilities

There would be no changes to personnel or utilities necessary as part of the Agency-Mitigated Alternative.

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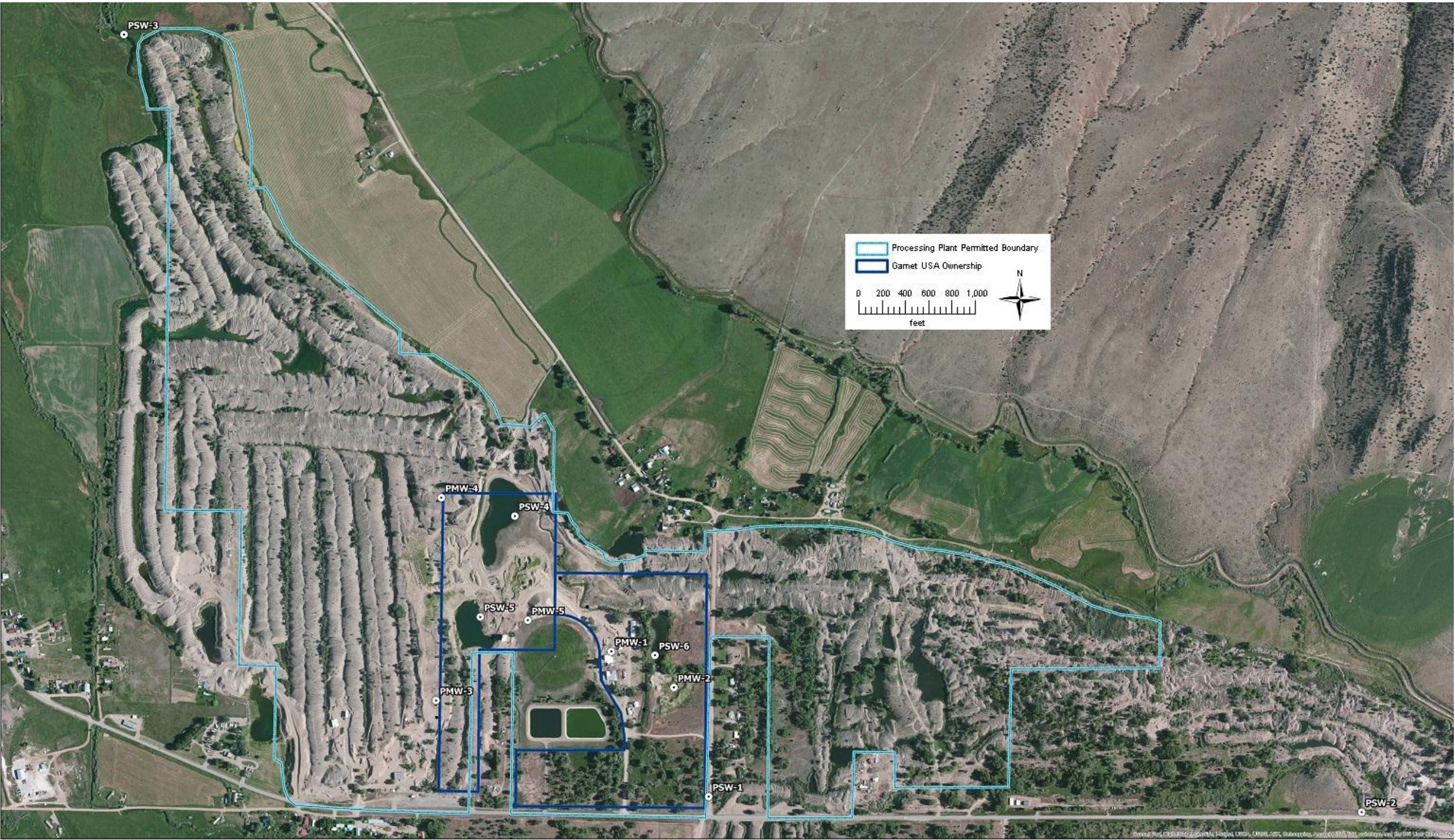


Figure 2.6-2. Proposed Surface and Groundwater Monitoring Locations at the Alder Gulch Processing Plant for the Garnet USA Project, Madison County, Montana.

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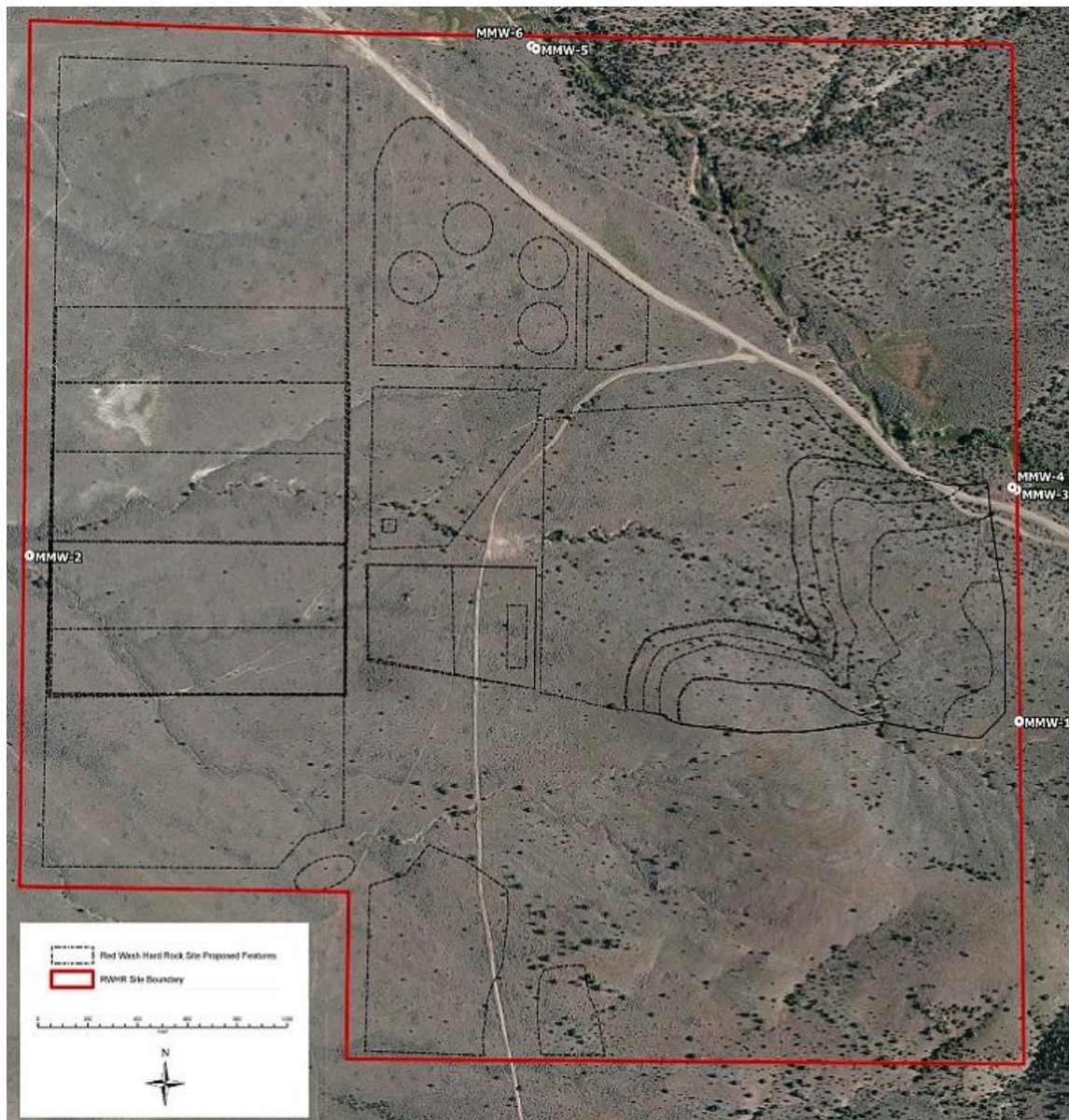


Figure 2.6-3. Proposed Groundwater Monitoring Locations at the RWHR Mine Site for the Garnet USA Project, Madison County, Montana.

2.6.5 Transportation

As part of the Proposed Action, employees would park and stage for carpooling to and from the RWHR Mine site in the designated parking area as previously described. A mitigation for traffic safety concerns along Ruby Road would be to retire the East Road access from the plant and extend the visibility berm southward to block the former entrance. Employees would enter and exit the processing plant using the South Road.

To reduce impacts due to conflict between ore haul trucks and local traffic, Garnet USA may modify the route of the haul trucks as they enter and leave the plant. Garnet USA would work to modify the route haul trucks take to enter and leave the processing plant. This is described in Section 2.6.1 above. The mitigation would involve 1) straightening the alignment of Anderson Lane with Ruby Road across State Route 287 and 2) creating a new northwest-trending access road off the south end of Ruby Road that directs truck traffic directly toward the main plant area. Ore trucks would enter and exit the plant by this route. The new entrance and road into the plant would remove these trucks from Ruby Road north of the entrance and separate them from the residents located further north (Figure 2.6-1).

2.6.6 Reclamation

Reclamation under the Agency-Mitigated Alternative would be the same as that described in Section 2.7 below, with the following exception: areas would be regraded as necessary before soil spreading. Compacted areas would be ripped with a dozer or grader to at least a depth of 12 inches prior to resoiling. Stockpiled soils or settling pond fines would be spread six inches deep. As a mitigation to ensure revegetation and reduce compaction, Garnet USA would take the following action: once the soil has been placed, any compacted areas would be ripped again with a dozer or grader to at least a depth of 12 inches prior to reseeding at the mine site and 6 inches at the plant site. Areas would be seeded with an approved seed mix.

2.7 Reclamation-Common to All Alternatives

The extent of reclamation at the RWHR site and the Alder Gulch facilities would be limited to the existing disturbances under the No Action Alternative. Under the Proposed Action, the extent and duration of the reclamation activities would be greater, but the methods, actions, and criteria would be the same.

The objective of the reclamation plan would be to restore the proposed mining area at the RWHR site to conditions compatible with present and future desired land uses and conditions compatible with state regulations. The reclamation plan would minimize areas affected, provide for stabilized post-mining slopes and soils, and protect air, surface water, and groundwater resources.

The reclamation plan would include reestablishment of wildlife habitat, restructuring of surface drainage patterns, and improved range productivity. Modifications to the plan would be made based on advancements in reclamation technology, operational changes, or results of on-site reclamation evaluations. Changes would be made only after consultation with and approval by appropriate regulatory agencies.

Mine site reclamation activities would provide concurrent contouring, soiling, and successful revegetation of any areas that would not be disturbed again throughout the life of the proposed mining operations. All other areas except those left for post-mine industrial use would be reclaimed at closure.

2.7.1 Post Mining Land-Use

The reclamation plan for the RWHR site would allow the mined lands to be used for grazing after recontouring, soiling, and revegetation is complete.

2.7.2 Site Facility Removal

There would be limited facilities at the RWHR site under the Proposed Action and Agency-Mitigated Alternative under consideration. Facilities would be removed upon mine closure.

Office Trailer and Facilities

At the completion of reclamation activities, the office trailer, lunch room, and service shop located at the RWHR site would be dismantled, hauled off site, and the site reclaimed as described above. The owner of lands affected by the office trailer and other support facilities could request some structures to remain after mine closure.

Fuel Facilities

Mobile fuel vehicles are proposed at the RWHR site, and all fuel for equipment would be brought in daily as needed. Prior to regrading, soiling, and seeding with the approved seed mix, the fleet ready line area would be inspected for contamination associated with fuel or other petroleum product spills. Any soil with potential contamination would be removed to an appropriate off-site disposal area before reclamation.

2.7.3 RWHR Mine Area Reclamation

Topography and Vegetation

The soil stockpiles would be revegetated for stabilization and control of erosion concurrently on an ongoing basis. The majority of the stockpiles would remain through the life of the operations, and as part of the final reclamation activities, would be reapplied to disturbed areas. Following their use in reclamation, the areas previously occupied by the soil stockpiles would be ripped and revegetated with the approved upland vegetation species mix.

The following fill procedure applies to the mining and milling waste rock stockpile as well as the areas north and south of the RWHR mine excavation. This does not apply to the mine pit excavation itself. The proposed grade for reclaimed slopes across the area is a minimum of 3:1, horizontal to vertical. During grading, small drainage features, such as swales, would be incorporated into slopes to break up the slopes and better approximate pre-mining topography which includes several shallow swales and small drainage features that traverse the permit area.

The operator would recontour the area to the extent possible to provide a concave, longitudinal profile form where the drainage enters the permit boundary to where it leaves the permit boundary. Bedrock control may be used to transition from native to reclaimed areas.

Following contouring activities, the stockpiled soil would be spread over regraded areas to approximate premine depths. Soiling and seedbed preparation processes are discussed in detail in the operating permit, and would conform to DEQ guidelines.

Once the soil has been placed, compacted areas would be ripped with a dozer or grader to at least a depth of 12 inches prior to reseeded. Areas would be seeded with a seed mix approved by DEQ. Detail on the RWHR Mine site and pit reclamation is provided in Section 2.5.7.

Roads

After closure of the RWHR Mine site, the expanded ranch road which heads eastward from the county road to the site would be regraded to 20 feet in width or less and all excess fill material would be removed or regraded. Disturbed portions of the expanded width would be ripped, regraded, and covered with previously stockpiled soil and seeded using the approved seed mix.

2.7.4 Personnel

Garnet USA anticipates scaling back the full production work force to approximately 15 to 20 employees during final reclamation after mine closure. Reclamation would occur concurrently with mining when possible for much of the mine project life, but a majority of reclamation work would occur at closure.

2.8 Related Future Actions

There are no actions currently under consideration or in the permitting process that are related to the proposed Garnet USA mine operation. Garnet USA is consulting with MDT on possible changes to State Route 287 resulting from the proposed alternative entrance to the Alder Gulch processing facility, but these discussions have not progressed to the point where details would be available beyond those described under the Agency-Mitigated Alternative.

2.9 Alternatives Considered But Dismissed

Under MEPA, a reasonable alternative is one that is practical, technically possible, and economically feasible. In addition, any alternative under consideration must be able to meet the purpose and need of the Proposed Action. During scoping, alternatives to the Proposed Action were suggested and have been discussed by agency representatives with Garnet USA. Alternatives covered in this section include alternatives or alternative components that were considered and eliminated from detailed study. For each alternative discussed, a synopsis of the changes proposed and a brief discussion of why the alternative or component was dismissed is included.

2.9.1 Relocation of Processing Facilities to RWHR Mine Site

During the scoping process moving the processing facility to the RWHR site was proposed as a way to reduce the impacts due to noise, light, traffic, and dust at the Alder Gulch processing site. Eventually the crushing machinery would be moved from the Alder Gulch site to the RWHR site as part of the Proposed Action (Garnet USA, 2013). Operation of the processing plant at the Alder Gulch Mine site, however, is currently permitted under Operating Permit No. 00157. Garnet USA did not include relocation of the processing plant in its application to amend the operating permit. Because relocation of the processing facility is neither requested by Garnet USA nor within DEQ's unilateral authority, relocation of the processing facility to the RWHR site will not be considered in detail.

Table 2.9-1. Comparison of Potential Impacts for Each Alternative Under Consideration.

Resource	No Action Alternative	Proposed Action	Agency-Mitigated Alternative
Geology	Alternative would result in removal of 10,000 tons of rock and ore under the exploration license. No additional impacts at the permitted Alder Gulch processing plant.	Alternative would result in removal of 500,000 tons per year of waste rock and ore. Yields are estimated to be 50,000 tons per year of finished garnet product. Surface geology would be permanently disturbed.	The level and extent of impacts to geology and geochemistry under this Alternative would be the same as that expected under the Proposed Action.
Soils	Alternative would result in minimal impacts to soil resources. All previously permitted surface disturbances that affect soil resources have already occurred.	Some soil would be irrevocably lost during soil removal, construction, and operation of the mine prior to the reestablishment of vegetation. Even with reclamation, there would be changes to the soil profile, structure, and make-up of the soils in the reclaimed areas that may limit vegetation reestablishment. The arid nature of the climate would contribute to a slow recovery of the soil structure.	<p>The level and extent of impacts to soils at the RWHR site under this Alternative would be the same as that expected under the Proposed Action.</p> <p>Approximately 0.5 acres of additional disturbance would be required for the development of the access route. This would not constitute substantial additional primary, secondary, or cumulative impacts to the soil resources at the Alder Gulch site.</p>
Vegetation and Wetlands	Alternative would result in some impacts to vegetation resources if dredging is reinitiated. All other previously permitted surface disturbances that affect vegetation resources have already occurred.	<p>Alternative would result in temporary impacts to vegetation and soil from construction of roads and facilities. Long term impacts would include changes in vegetation communities and a decrease in community diversity after reclamation.</p> <p>Noxious weeds have the potential to spread due to disturbed acreage.</p>	<p>Development of the alternative Alder Gulch site access road would increase impacts to vegetation and wetlands. Approximately 0.06 acres of wetlands are expected to be filled or disturbed during road construction.</p> <p>Increasing the area of disturbance may increase the potential for weed spread.</p>

Resource	No Action Alternative	Proposed Action	Agency-Mitigated Alternative
Surface Water	There would be primary and secondary impacts to surface water if dredging of tailings is pursued through implementation of the No Action Alternative. All other previously permitted disturbances that affect surface water resources have already occurred.	<p>Recirculation and reuse of water during processing separation may allow for a concentration of nitrogen compounds in the water that could potentially be released to groundwater or surface water. A surface water and groundwater monitoring plan is in-place to establish a baseline of water quality at the plant site. This plan includes future sampling as needed.</p> <p>Primary impacts to surface water resources at the RWHR Mine site would include irreversible alterations to the ephemeral drainages. Potential secondary impacts include wind and surface water runoff which would carry sediments and nitrogen compounds offsite and increase concentrations in nearby surface water resources.</p>	Construction of the access route would increase surface disturbance near Alder Gulch and may introduce sediment or pollutants to the stream or wetlands.
Groundwater	There would be limited potential for primary and secondary impacts to groundwater through implementation of the No Action Alternative if dredging of the tailings piles is pursued. All previously permitted disturbances that affect groundwater resources have already occurred.	There would be no primary impacts to the groundwater from the newly constructed, lined ponds because they would not intersect the water table. The lined ponds could have secondary impacts to the groundwater if a liner leaked. A leak could allow recycled process water with nitrogen compounds to reach groundwater.	<p>The level and extent of impacts to groundwater under this Alternative would be the same as that expected under the Proposed Action.</p> <p>Additional groundwater monitoring is proposed as part of this alternative.</p>
Air Quality	There would be no primary or secondary impacts to air quality through implementation of the No Action Alternative. All activities that affect air quality resources are previously permitted.	The level of impact to air quality would increase in duration, but not in intensity as the project is expected to continue for 37 years.	The level and extent of impacts to air quality under this Alternative would be the same as that expected under the Proposed Action.

Resource	No Action Alternative	Proposed Action	Agency-Mitigated Alternative
Noise	<p>The noise levels of the equipment and activities for the No Action Alternative were based on when the plant is operating, as it has intermittently over the last several decades. . There would be no primary or secondary noise impacts for the No Action Alternative.</p>	<p>Plant operations between 7:00 a.m. and 5:00 p.m. would be barely to clearly audible because the incremental increase above ambient noise levels would only be +3 to +6 dBA. If the plant operates continuously for 24 hours per day, the +14 dBA increase would be considered more than twice as loud as the L_{dn} 40 dBA ambient noise without the plant operating, which would be a significant noise impact at residences near the Alder Gulch site.</p> <p>Noise levels of the diesel equipment and rock drill at the RWHR site at the closest residence one mile west of the site would be similar to the noise levels during exploration.</p> <p>The increased haul truck traffic may create a moderate noise impact.</p>	<p>All aspects of the Agency Mitigated Alternative would be the same as the Proposed Action, except that the ore truck access to the Alder Gulch processing plant would be redirected from Ruby Road. The proposed access road would move the haul truck traffic farther from the Ruby Road residences and would reduce the truck noise at the residences.</p>
Socioeconomics	<p>The No Action Alternative would retain the existing workforce at the Alder Gulch processing plant.</p>	<p>Under the Proposed Action, Garnet would increase its employees to 30-60 individuals. These jobs are likely to pay wages higher than the average for Madison County, and would constitute a localized, long-term benefit to the community.</p>	<p>All aspects of the Agency Mitigated Alternative would be the same as the Proposed Action. The access road construction may generate a small number of additional short-term jobs in the community.</p>

Resource	No Action Alternative	Proposed Action	Agency-Mitigated Alternative
Transportation	Alternative would include highway-legal dump trucks hauling approximately four to eight truckloads per day using Anderson Lane and Ruby Road for a limited period of time under the exploration license. Other potential primary impacts due to haul truck and other traffic would include increased noise, dust, and lights from truck traffic on Ruby Road in front of residences.	This Alternative would increase the number of truck trips between the RWHR Mine site and the processing plant to 45 truck trips per operating day. The most likely times for the haul trucks to affect other traffic would be in the morning and evening commute hours, during school bus loading time, and seasonally in the summer when tourism increases traffic on State Route 287. Primary impacts to transportation could include delays to traffic as the haul trucks cross State Route 287 to Ruby Road from Anderson Lane. Impacts due to noise, light, and dust would increase as compared to the No Action Alternative. Increasing traffic on local roads may cause an increase in traffic accidents.	The alternative access road would not reduce the number of truck trips described under the Proposed Action, but it would provide a shorter and more direct haul route to the processing plant. The partial realignment of Anderson Lane and Ruby Road may allow trucks to cross State Route 287 more efficiently. This could also reduce the overall likelihood of conflict with other traffic and increase traffic safety along the route. The angled access route would reduce the potential for impacts due to noise, dust, and light along Ruby Road.
Fisheries	Under the existing exploration license, processing operations may cause fluctuations in pond water levels, but impacts to fisheries would be minor. Impacts to fisheries would be linked to potential impacts to groundwater and surface water as described above.	The level of impact to fisheries at the Alder Gulch site would increase in duration, and may increase slightly in intensity as the rate of water use for processing increases and is expected to continue for 37 years. Impacts to fisheries would be linked to potential impacts to groundwater and surface water as described above. The lined, water recycling ponds will not contain fish.	Impacts to fisheries would be linked to potential impacts to groundwater and surface water as described above.

Chapter 3: Affected Environment

3.1 Introduction

Chapter 3 describes components of the existing environment that could be affected by the Proposed Action or alternatives to the Proposed Action. The Proposed Action is described in detail in Section 2.5 of Chapter 2.

Chapter 3 serves three purposes: (1) it provides a baseline from which to analyze and compare alternatives and their impact; (2) it ensures that DEQ has a clear understanding of the environment potentially affected by the Proposed Action; and (3) it provides the public information to evaluate the agency's alternatives, including the Proposed Action. The environmental components described in this chapter include air, water, geology, soils, vegetation, fish and wildlife, cultural, visual, land use, transportation, and socioeconomics. In general, the affected environment is defined by the extent to which the implementation of the Proposed Action would affect each resource.

The study areas are defined in the methods sections for each resource, as they may vary in location and extent. Discussions are limited to resources within areas where issuance of the operating permit amendment would create new disturbance or where proposed activities would change from those permitted under the current operating permit. There are two distinct sites with the potential to be affected by the alternatives under consideration: 1) the processing plant area within the Alder Gulch permit area and 2) the proposed RWHR Mine permit area where the proposed open pit excavation would occur on private lands. Because the two sites are separated by several miles and one site is relatively undisturbed while the other is an operating processing plant, their environments and resources differ substantially in many respects. Several sections of this Chapter describe the two areas separately for clarity.

The Alder Gulch processing plant and the Red Wash Alluvial site are permitted under MMRA Operating Permit No. 00157. Activities described in the mine permit or the environmental effects of those activities at these two sites have already been approved and are not considered in this analysis.

Each section below summarizes the current conditions by resource. Activities approved or completed under the existing permit are part of the existing environment and will be included in this chapter. Much of the information in this chapter was collected as part of the operating permit amendment application (Garnet USA, 2013). Data collected from electronic databases and other online resources were also important in the evaluation of the project area environment. Data queries were rerun and updated as appropriate. Chapter 3 does not contain all of the information from the operating permit amendment application or its appendices. Rather, this chapter attempts to distill the key aspects of the environment that are most likely to be affected by any alternative under consideration. Sections will refer the

reader to pertinent references where original study results can be reviewed. A compilation of all references used in the EIS is provided in Chapter 8.

3.2 Geology and Minerals

This section provides a description of the general and site-specific geologic setting, alteration, and ore mineralization in the vicinity of the Alder Gulch processing plant and the proposed RWHR Mine.

3.2.1 Overview and Analysis Area

The existing conditions of geologic and mineral resources were evaluated for two permit areas, the Alder Gulch site and the proposed RWHR Mine site. Except for a general discussion of historical mining activities, the analysis area was limited to within the permit boundary at each location since operations that may affect geology and mineral resources would be restricted to these areas under the alternatives under consideration.

3.2.2 Methods

Existing geologic conditions were compiled primarily from information contained within Garnet USA, LLC's operating permit amendment application (Garnet USA, 2013). The geologic and stratigraphic descriptions were derived from mapping and reporting from the United States Geological Survey (USGS) (Ruppel et al., 1993) and the Montana Bureau of Mines and Geology (MBMG) (McDonald et al., 2012). The mineral resources and geochemistry was reviewed in studies completed by (Evans & Moyle, 2006; Frishman et al., 1993; Burger et al., 1996; Pearson et al., 1990).

3.2.3 Results

Geologic and Historic Mining Context

The Alder Gulch permit area is located in the Alder Gulch drainage in southwestern Montana (Figure 1.1-2). The RWHR Mine site is located about 4.5 miles to the southeast on uplands above the valley bottoms. The sites are flanked by the Tobacco Root Mountains to the north, the Gravelly and Greenhorn Ranges to the east, and the Ruby Range to the west (Garnet USA, 2013). The mountain ranges are predominately uplifted Precambrian metamorphic rocks of igneous and sedimentary origin with Late Cretaceous granitic intrusions (Burger et al., 1996). Locally, unconsolidated Quaternary alluvial sediments consisting of sand, gravel, and boulders are present in stream and river valleys (Ruppel et al., 1993; Garnet USA, 2013).

Alder and surrounding areas have a long gold mining history dating to the latter half of the nineteenth century. The present tailings near Alder are the result of gold dredging that is reported to have begun in 1889 and extended into the twentieth century. In recent decades, attention has turned from gold mining to garnet mining (Evans & Moyle, 2006; Garnet USA, 2013).

Garnet in mineable concentrations has been identified in three types of deposits: (1) tailings from historic dredge mining along Alder Gulch, (2) alluvial deposits in the Red Wash area, and (3) metamorphic bedrock, which is thought to be the source of the garnet in the alluvial deposits (Evans & Moyle, 2006; Garnet USA, 2013). Beginning in the 1990's, garnet deposits in the historic tailings near Alder were mined by a series of entities at what is herein referred to as the Alder Gulch site. Subsequently, in the 2000's, mining was initiated in an alluvial garnet deposit located southeast of Alder in the Red Wash drainage (Evans & Moyle, 2006).

Mining at the Red Wash Alluvial site and Alder Gulch sites is currently permitted under Montana Metal Mine Reclamation Act Operating Permit No. 00157, and is thus considered part of the existing environment for the purposes of evaluating the Proposed Action. Mining has not previously occurred at the proposed RWHR Mine site, although Garnet USA has conducted test drilling, trenching, and test pit construction at the site under DEQ Hard Rock Exploration License No. 00642 (Garnet USA, 2013a; Garnet USA, 2013b).

Alder Gulch Site

The Alder Gulch site sits atop Quaternary alluvium near the mouth of the Ruby Valley. A general geologic map of the area is shown in Figure 3.2-1. These alluvial sediments primarily comprise sand, gravel, and boulders derived from nearby Precambrian bedrock. The alluvial sediments are underlain by Tertiary lake bed deposits consisting of ash-derived clay strata, volcanic ash beds, and sandstone. These lake bed deposits are informally known as the "false bedrock" horizon at the Alder Gulch site, and have been identified during drilling as a clay stratum typically 20 to 30 feet thick beneath the tailings within the Alder Gulch permit area. Previously, garnet mining has occurred at the Alder Gulch site by reprocessing historic dredge tailings (Garnet USA, 2013a; Garnet USA, 2013b).

RWHR Site

Garnet at the proposed RWHR Mine site occurs in structurally deformed, metamorphosed crystalline bedrock. Mineable concentrations of garnet at the RWHR site are reportedly found in rock types including biotite schist, migmatite, and amphibolite, as well as in garnet-bearing granitic and pegmatite dikes that have intruded these metamorphic rocks. These granitic intrusions have locally altered garnet and other minerals to talc and chlorite (Evans & Moyle, 2006; Garnet USA, 2013).

Detailed geologic mapping conducted at the RWHR site by Garnet USA resulted in further delineation of three garnet-bearing rock units and an igneous intrusive unit, all of which would be mined at times during the life of the proposed mine. Garnet USA has named these units the 1) garnet gneiss (GG), 2) upper felsic gneiss (UFG), 3) lower felsic gneiss (LFG), and 4) igneous intrusive (IGI)(granite and pegmatite dikes). The subsurface extent and structure of these garnet-bearing units is not well understood, but additional diamond drilling is planned under the Proposed Action in order to further delineate their nature and extent (Garnet USA, 2013a).

Waste Rock Geochemistry

Garnet USA conducted a sampling investigation during March 2012, which involved the collection of composite whole rock samples from the garnet gneiss, the upper felsic gneiss, the lower felsic gneiss, and the igneous intrusive units. Samples were collected from outcrops, trenches, and test pits and were submitted to laboratories for asbestiform mineral and whole rock geochemical analyses (Garnet USA, 2013a).

As part of the whole rock geochemical analyses conducted by Garnet USA, static tests were conducted to assess the acid generating potential of the rock units that would be mined under the Proposed Action. These static tests, called neutralization potential and acid generating potential tests, are used to calculate a predictive parameter called acid-base accounting (EPA, 1994). The results from static testing suggest that there is a low risk for acid generation by the rocks that would be mined (Garnet USA, 2013a). Additionally, Garnet USA's analytical results indicate that sulfur was not detected in any form in any of the samples collected. Sulfide mineralization is the primary contributing factor to the development of acid rock drainage, and its absence is consistent with a low acid generating potential. Asbestiform minerals are present in the parent materials, but testing for fibers in four samples did not identify fibers at detectable levels. The analytical results for whole rock geochemical analysis are provided in Table 3.2-1 below.

In June 2013, toxicity characteristics leaching procedure (TCLP) test was conducted on a garnet ore sample. The sample was analyzed for leachable mercury, arsenic, barium, cadmium, chromium, lead, selenium, and silver. TCLP analytical results were all reported below detection limits.

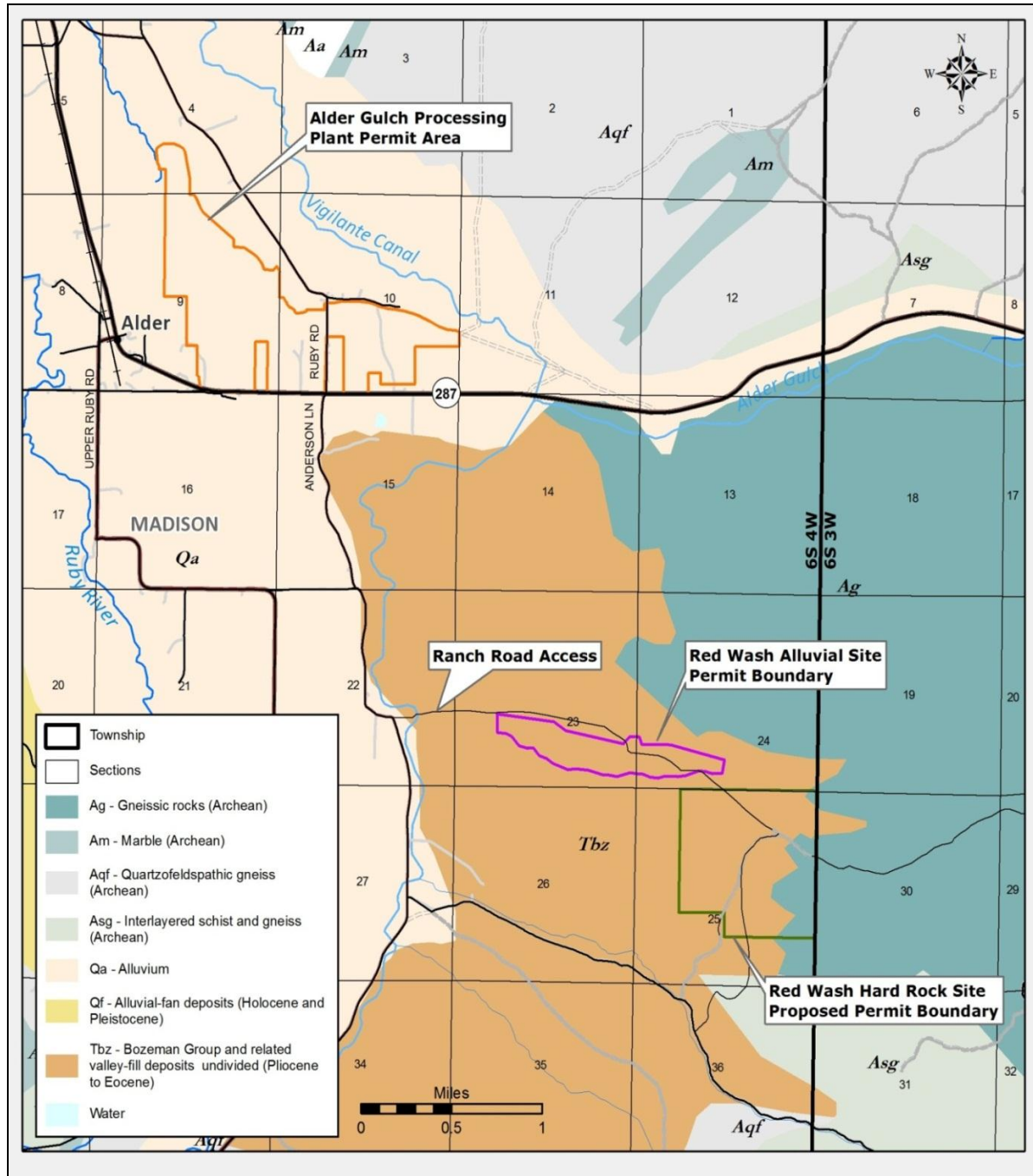


Figure 3.2-1. Geology Underlying the Garnet USA Permit Boundary Areas, Madison County, Montana.

Table 3.2-1. Whole Rock Geochemistry Sample Results, RWHR Mine Site, Madison County, Montana.

Analyte	RWHR-WRG-12-UFG	RWHR-WRG-12-GG	RWHR-WRG-12-LFG	RWHR-WRG-12-IGI
Arsenic (mg/kg)	1.23	0.753	1.26	1.12
Beryllium (mg/kg)	<0.100	<0.100	<0.100	.110
Cadmium (mg/kg)	<0.100	<0.100	<0.100	<0.100
Molybdenum (mg/kg)	5.07	4.82	4.87	3.14
Selenium (mg/kg)	0.527	1.63	2.01	1.6
Thallium (mg/kg)	<0.100	<0.100	<0.100	<0.100
Uranium (mg/kg)	.382	0.586	0.345	0.754
Aluminum (mg/kg)	806	8970	5970	12800
Antimony (mg/kg)	<2.0	<2.0	<2.0	<2.0
Barium (mg/kg)	19.3	32.7	55.6	38.8
Bismuth (mg/kg)	<6.0	<6.0	<6.0	8.5
Boron (mg/kg)	<4.0	<4.0	<4.0	4.9
Calcium (mg/kg)	322	5300	833	1750
Chromium (mg/kg)	65.7	96.3	95.3	75.3
Cobalt (mg/kg)	<0.60	10.5	5.21	10.2
Copper (mg/kg)	2.26	165	46.5	23.3
Iron (mg/kg)	920	13900	13600	23700
Lead (mg/kg)	1.69	1.19	2.32	6.29
Lithium (mg/kg)	<2.0	5.3	7.9	12.5
Magnesium (mg/kg)	54.6	7820	2250	12000
Manganese (mg/kg)	29.4	119	61.8	192
Nickel (mg/kg)	11.3	50.2	41.7	27.0
Silver (mg/kg)	<0.50	<0.50	<0.50	<0.50
Strontium (mg/kg)	1.53	7.11	2.45	10.4
Tin (mg/kg)	<5.0	<5.0	<5.0	<5.0
Vanadium (mg/kg)	0.77	64.8	67.1	46.0
Zinc (mg/kg)	1.73	19.0	29.9	27.6
Mercury (mg/kg)	<0.033	<0.033	<0.033	<0.033
ABA (TCaCO3/kT)	1.0	12.6	4.0	8.1
AGP (TCaCO3/kT)	<0.3	<0.3	<0.3	<0.3
ANP (TCaCO3/kT)	1.0	12.6	4.0	8.1
Non-extractable Sulfur (%)	<0.01	<0.01	<0.01	<0.01
Non-sulfate Sulfur (%)	<0.01	<0.01	<0.01	<0.01
Pyritic Sulfur (%)	<0.01	<0.01	<0.01	<0.01
Sulfate Sulfur (%)	<0.01	<0.01	<0.01	<0.01
Total Sulfur (%)	<0.01	<0.01	<0.01	<0.01

3.3 Soil Resources

3.3.1 Overview and Study Area

Soil type and characteristics were evaluated in the proposed permitted boundary for the Alder Gulch processing plant area and the RWHR mine site.

3.3.2 Methods

Baseline investigation of soils in the Alder Gulch permit area was conducted during the summer of 1991 to (1) delineate, classify, and map the location and extent of soil types, (2) estimate average depth of soil for potential salvage use, (3) assess soil characteristics, and (4) provide information for use in reclamation plans (Hydrometrics Inc., 1992). Additional soils information for the sites was obtained from the Madison County Soil Survey (NRCS, 2011).

3.3.3 Results

Soils identified in the Alder Gulch permit area were classified as Entisols. They formed in mixed stream alluvium composed predominantly of quartz, feldspar, silicates, magnetite, and garnet, and were disturbed by placer mining activities occurring between 1899 and 1922. Some portions of the permit area were placer mined as late as the 1930s and 1940s. The Entisols lacked diagnostic horizons, and well developed genetic horizons were absent in many of the soils.

Most of the Alder Gulch permit area is dredge tailings or piles consisting of gravels, cobbles, and boulders. In some areas, these dredge tailings consist of fine-grained material (less than two mm) that filled interstices existing between coarse-grained fragments. In most locations; however, tailings piles are devoid of fines as a result of early placer mining techniques that placed coarse-grained cobble waste over fine-grained wastes. Placer tailings are mapped as Ustic Torriorthents, hilly and Ustic Torriorthents, gently sloping soil units. These soils are found in flood plains and stream terrace deposits, and develop from sandy and gravelly alluvium parent material.

Soils at the proposed RWHR Mine permit area are composed of a mixture of Kalsted Sandy Loam, 2 percent to 8 percent slopes, Shurley-Rentsac-Rock outcrop complex, 8 to 35 percent slopes and Shurley-Rock outcrop complex, 25 to 60 percent slopes. Kalsted Sandy Loam is a deep, well-drained soil on terraces and hills, mainly in intermountain valleys and formed in calcareous alluvium at elevations ranging from 4,500 to 6,500 feet. Average annual precipitation is about 12 inches, average annual air temperature is about 40 degrees F, and average frost free period is about 100 days. Typically, the surface layer of this Kalsted soil was pale brown sandy loam 7 inches thick. From 7 to 11 inches from the soil surface, the underlying material was very pale brown sandy loam. From 11 to 30 inches in depth, the subsoil was white sandy loam and from 30 to 60 inches or more was pale brown, gravelly sandy loam with strata of loamy sand.

Permeability was moderately rapid. Available water holding capacity was about 7 inches in the top 60 inches. Effective rooting depth was 60 inches or more. Where this soil was under native vegetation, the average annual wetting depth was about 20 inches. Runoff was medium and hazard of water erosion was moderate while the hazard of wind erosion was high. This soil was calcareous throughout. This soil unit was used primarily for irrigated crops (mainly alfalfa for hay and grasses and legumes for pasture) and secondarily for non-irrigated crops (small grains) and as rangeland.

The major component of Shurley-Rentsac-Rock outcrop complex 8 to 35 percent slopes are Shurley (35%) and Rentsac (35%) soils. Other components are rock outcrops (20%) and 10% minor soil components (Nuley (5%) and Yetull (5%) soils). The major component of Shurley-Rentsac-Rock outcrop complex 25 to 60 percent slopes is Shurley (40%) soils. Other components are rock outcrop (40%) and minor component soils (Rentsac (7%), Yetull (7%), and Nuley (6%)).

Shurley soils are deep well-drained soils found on hill foot-slopes. Shurley soils form in sandy and gravelly colluvium derived from granite and gneiss at elevations between 1,900 and 6,500 feet. Average annual precipitation is 10 to 15 inches and mean annual air temperature ranges between 37 and 45 degrees Fahrenheit with frost-free periods of 90 to 135 days. Typical profiles contain very coarse-grained sandy loam to 10 inches and loamy coarse-grained sand from 10 to 60 inches with depth to restrictive feature and water table more than 80 inches.

Rentsac soils are shallow well-drained soils found on shoulders and backslopes of hills and ridges. Rentsac soils are residuum weathered from calcareous sandstone found at elevations between 1,900 and 6,500 feet. Typical profile of Rentsac soils are channery sandy loam from 0 to 4 inches, very channery loam from 4 to 16 inches, and unweathered bedrock 16 to 60 inches. Depth to the water table is more than 80 inches.

3.4 Vegetation and Wetland Resources

Vegetation resources evaluated include vegetation communities, special status plants, wetlands, and noxious weed species.

3.4.1 Overview and Study Area

The existing conditions of vegetation and wetland resources were evaluated for the two permit areas, the Alder Gulch site and the proposed RWHM Mine site. Except for a general discussion of surrounding vegetation communities, the analysis area was limited to within the permit boundary at each location since operations that may affect vegetation or wetlands resources would be restricted to these areas under the alternatives under consideration. 2013 Wetland delineations at the Alder Gulch permit area were limited to areas with potential to be affected by proposed activities, and did not cover the entire permit area.

3.4.2 Methods

Materials provided from a 1991 vegetation survey were reviewed and compared to field surveys conducted in May and June 2013 (Babcock, 2013). Plant communities were summarized in species tables.

Wetlands

Existing background information from the National Wetlands Inventory (2013), Madison County soil survey, and previous wetland delineations for the project area were reviewed. During June 2013, wetland specialists conducted field determinations for wetlands at the Alder Gulch processing plant and RWHR Mine site (VanFossen, 2013). These determinations involved the initial identification of representative plant community types in the subject area and then characterization of vegetation, soils, and hydrology. Three criteria were evaluated to determine wetland status including the presence of 1) hydrophytic vegetation, 2) hydric soils, and 3) supporting hydrology. These three technical criteria must all be met for an area to be identified as a wetland using the US Army Corps of Engineers (USACE) wetland determination method (USACE, 1987). Prior wetland delineations were conducted at the Alder Gulch processing plant in 1991. Results from prior surveys were compared to the 2013 delineations. Wetlands (hydrophytic) vegetation communities, along with hydric soils and wetlands hydrology, were used to identify "jurisdictional" wetlands for the purpose of potential compliance with Section 404 of the Clean Water Act.

Throughout this document, common names are used in the text, and the corresponding scientific names are provided in tables for clarity and to increase the readability of the text.

3.4.3 Results

Upland and wetlands vegetation communities occur within the permit areas. Hydrophytic (wetlands) vegetation communities occupy sites where water remains at or close to the land surface for a substantial portion of the growing season. Forested upland communities with an overstory of black cottonwood predominated where groundwater saturates the tailings at a depth of about two to 12 feet beneath the surface. Sparse shrub upland communities dominated by rubber rabbitbrush and big sagebrush occurred on the arid, rocky, high tailings piles over the greatest portion of the permit area. The permit area at the proposed RWHR Mine site is predominately upland communities of montane sagebrush steppe and Rocky Mountain lower montane, foothill, and valley grassland communities. An unnamed intermittent stream passes through the RWHR site and provides a limited riparian shrub community.

Wetlands Vegetation Communities

Alder Gulch Permit Area

Wetlands vegetation communities occur along the shorelines of ponds within the permitted area, along the short segment of Alder Gulch in the tailings area, and within depressions (valleys) of the tailings where groundwater saturates the substrate to the surface for a

portion of the growing season. Wetlands within the Alder Gulch permit area are identified on Figure 3.4-1.

Wetlands vegetation communities along the short section of Alder Gulch in the flat tailings areas were dominated by cattail, emergent grasses, and sedge species. A list of wetland plant species identified during the wetlands survey is shown in Table 3.4-1. Wetlands vegetation communities growing in linear depressions of the tailings had an overstory of black cottonwood (10 to 20 percent canopy cover) and an irregular shrub canopy dominated by sandbar willow, Pacific willow, prickly gooseberry, and prickly rose. At the Alder Gulch processing plant approximately 0.51 acres of wetlands polygons and 4,363 feet of linear wetlands were mapped (VanFossen, 2013). The overstory consists of narrowleaf cottonwood with sandbar willow, reed canarygrass, and timothy in the understory. Hydric soils were classified as redox dark surface and hydrology indicators included water stained leaves, oxidized rhizospheres, and the presence of reduced iron.

RWHR Mine Site

At the proposed RWHR Mine site, the ephemeral washes within and surrounding this site lack any evidence of wetlands vegetation. An intermittent stream channel intersects the proposed RWHR Mine site in the northeast corner that contains pockets of riparian and wetlands vegetation within the channel (Figure 3.4-2). This stream is north of the proposed access road and outside of the area directly impacted by mining activities. The drainage consists of minor ponding areas and has been historically manipulated to provide watering areas for stock use.

The intermittent drainage in the northeast corner of the section contains approximately 1.07 acres of wetlands. The overstory consisted of narrowleaf cottonwood with Nebraska sedge, few-flower spikerush, wood's rose, mountain rush, field horsetail, Kentucky bluegrass, and beaked sedge (Table 3.4-1). The hydric soils included sandy mucky mineral and sandy redox. Surface water and a high water table were the hydrological indicators at the site. The USACE visited the proposed RWHR Mine site in June 2012 to evaluate wetland or riparian areas and made a jurisdictional determination that there was no visual evidence of wetland or riparian areas within the area of mining disturbance (Garnet USA, 2013).

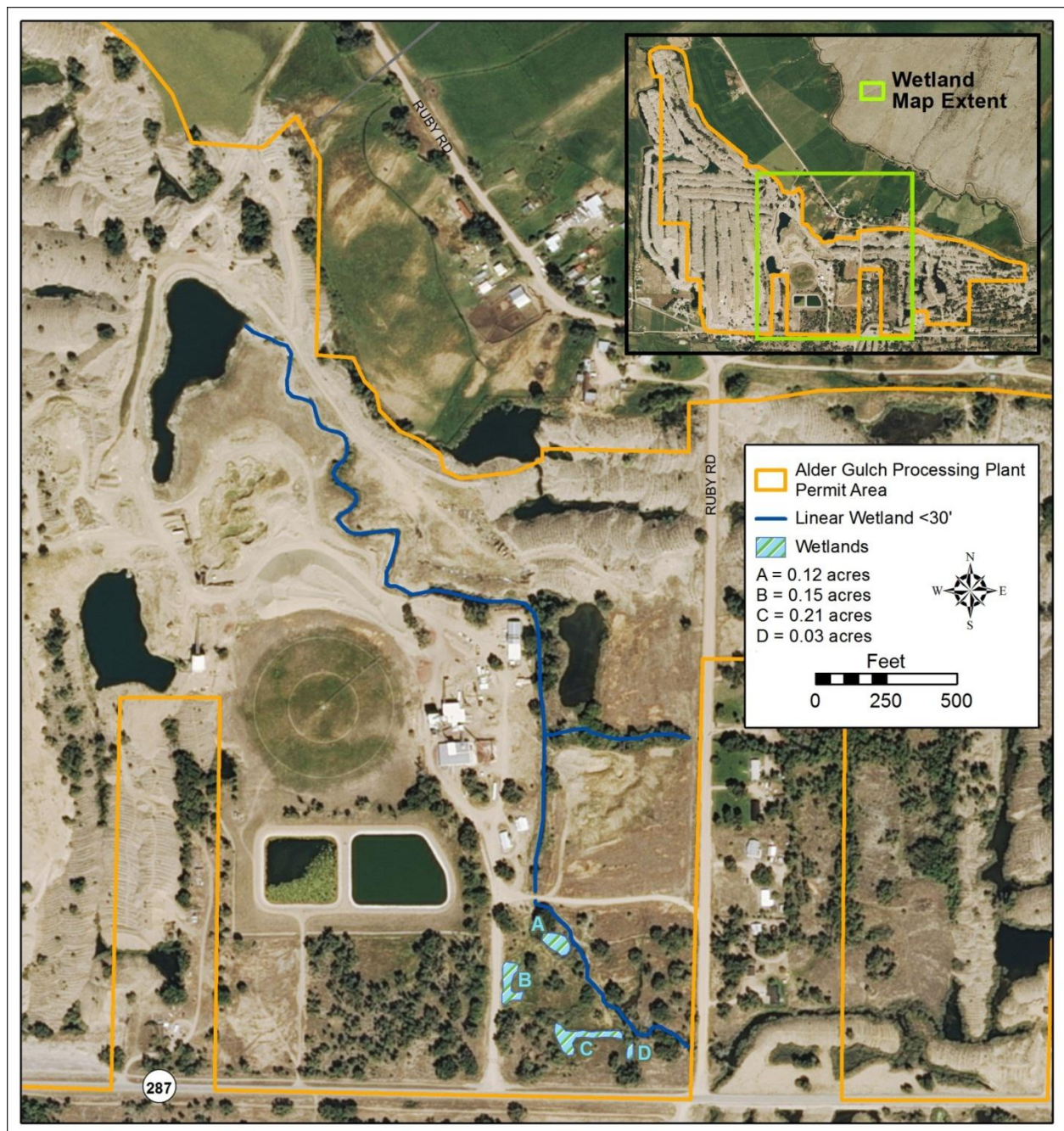


Figure 3.4-1. Wetlands Delineated within the Alder Gulch Permit Area, Madison County, Montana.

Table 3.4-1. List of Wetland Plant Species Identified at the Alder Gulch Processing Plant and RWHR Mine Site, Madison County, Montana.

Common Name	Scientific Name ^a	Alder Gulch Processing Plant	RWHR Site
Redtop	<i>Agrostis stolonifera</i>	x	
Sloughgrass	<i>Beckmannia syzigachne</i>	x	
Columbia sedge	<i>Carex aperta</i>	x	
Wooly sedge	<i>Carex pellita</i>	x	
Nebraska sedge	<i>Carex nebrascensis</i>		x
Beaked sedge	<i>Carex rostrata</i>		x
Few-flower spikerush	<i>Eleocharis pauciflora</i>	x	x
Field horsetail	<i>Equisetum arvense</i>	x	x
Reed mannagrass	<i>Glyceria grandis</i>	x	
Foxtail barley	<i>Hordeum jubatum</i>	x	
Taper-tip rush	<i>Juncus acuminatus</i>	x	
Mountain rush	<i>Juncus balticus</i>		x
Threadrush	<i>Juncus filiformis</i>	x	
Duckweed	<i>Lemna minor</i>	x	
Reed canarygrass	<i>Phalaris arundinacea</i>	x	x
Timothy	<i>Phleum pratense</i>		
Purple dragon-head	<i>Physotegia parviflora</i>	x	
Kentucky bluegrass	<i>Poa pratensis</i>	x	x
Narrowleaf cottonwood	<i>Populus angustifolia</i>	x	x
Black cottonwood	<i>Populus balsamifera</i>	x	?
Aquatic buttercup	<i>Ranunculus aquatilis</i>	x	
Prickly gooseberry	<i>Ribes setosum</i>	x	
Wood's rose	<i>Rosa woodsii</i>	x	x
Sandbar willow	<i>Salix exigua</i>	x	x
Pacific willow	<i>Salix lasiandra</i>	x	
Cattail	<i>Typha latifolia</i>	x	

^a (Lesica, 2012)

Upland Vegetation Communities

A vegetation survey was conducted in 1991 covering the Alder Gulch permit area (Garnet USA, 2013a). The Red Wash Alluvial site, which comprises similar vegetation, soils, and exposure to the RWHR Mine site was given a cursory vegetation review when it was permitted (Ruby Valley Garnet, 2006). The two Red Wash sites are less than one-half mile apart.

Alder Gulch Permit Area

There is a forested vegetation community dominated by black cottonwood (55 percent canopy cover), Rocky Mountain juniper (15 to 20 percent canopy cover), and a sparse shrub and herbaceous understory that occurs on the flat tailings areas. Shrubs include big sagebrush, rubber rabbitbrush, prickly pear cactus, broom snakeweed, and prickly gooseberry. Herbaceous species include grasses such as cheatgrass brome, Kentucky bluegrass, and foxtail barley; common opportunistic plants including dandelion, alfalfa, aster,

alyssum, black medic, mullein, red clover and white clover. Canada thistle, black henbane, musk thistle and spotted knapweed are noxious weeds that are also present.

A sparse shrub/herbaceous vegetation community occurred on most of the high tailings piles. Rubber rabbitbrush was the dominant species on most vegetated areas; however, big sagebrush, prickly currant, prickly rose, and matrimony vine were present on some sites (Garnet USA, 2013). Representative herbaceous species included cudweed sagewort, goldenrod, wildrye, annual willow-herb, and lambsquarters, Russian thistle, needle-and-thread, plantain, fumitory, mullein, verbenas, and crested wheatgrass. A more complete list of vegetation species observed is provided in Table 3.4-2.

RWHR Mine Site

The RWHR Mine site comprises a mixture of grassland and sagebrush steppe communities with scattered populations of Rocky Mountain juniper. The sagebrush component was generally dominated by mountain big sagebrush with an understory of Idaho fescue, spike fescue, and oatgrass. Other shrub species included three-tip sagebrush, antelope bitterbrush, and rubber rabbitbrush. Grassland species included cool-season perennial bunchgrasses such as Idaho fescue, rough fescue, and bluebunch wheatgrass.

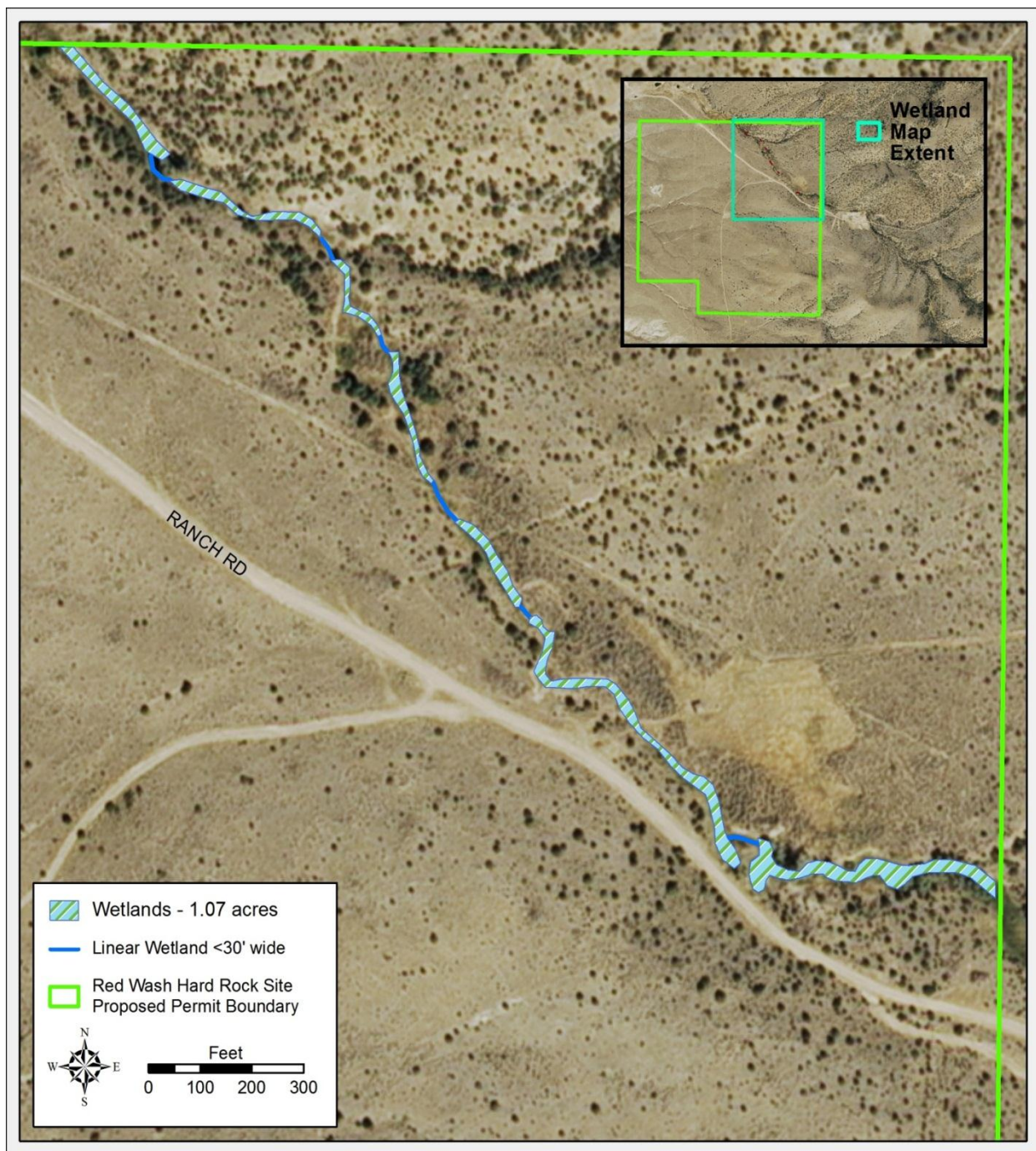


Figure 3.4-2. Wetlands Delineated within the Red Wash Hard Rock Mine Permit Area, Madison County, Montana.

Table 3.4-2. List of Upland Plant Species Identified at the Alder Gulch Mine and RWHR Mine Sites, Madison County, Montana.

Common Name	Scientific Name ¹	Alder Gulch Mine Site	RWHR Site
Yarrow	<i>Achillea millefolium</i>		x
Crested wheatgrass	<i>Agropyron cristatum</i>	x	
Alyssum	<i>Alyssum alyssoides</i>	x	
Green amaranth	<i>Amaranthus retroflexus</i>	x	
Pussytoes	<i>Antennaria</i> spp.		x
Holboell's rockcress	<i>Boechnera retrofracta</i>	x	
Fringed sagewort	<i>Artemisia frigida</i>	x	
Big sagebrush	<i>Artemisia tridentata</i>	x	x
Three tip sagebrush	<i>Artemisia tripartita</i>		x
Cudweed sagewort	<i>Artemisia ludoviciana</i>	x	
Aster	<i>Symphotrichium ericoides</i>	x	
Vetch	<i>Astragalus</i> spp.		x
Hoary allysum	<i>Berteroa incana</i>		x
Downy brome	<i>Bromus tectorum</i>	x	x
Sheperd's purse	<i>Capsella bursa-pastoris</i>	x	
Musk thistle	<i>Carduus nutans</i>		x
Spotted knapweed	<i>Centaurea maculosa</i>	x	x
Lambsquarters	<i>Chenopodium album</i>	x	
Jerusalem oak	<i>Chenopodium botrys</i>	x	
Conyza	<i>Conyza canadensis</i>	x	
Prickly currant	<i>Ribes lacustre</i>	x	
Canada thistle	<i>Cirsium arvense</i>	x	
Houndstongue	<i>Cynoglossum officinale</i>	x	x
Oatgrass	<i>Danthonia intermedia</i>		x
One spike danthonia	<i>Danthonia unispicata</i>		x
Annual willow-herb	<i>Epilobium brachycarpum</i>	x	
Rubber rabbitbrush	<i>Ericameria nauseosa</i>		
Wildrye	<i>Elymus canadensis</i>	x	
Filago	<i>Filago arvensis</i>	x	
Rough fescue	<i>Festuca campestris</i>		x
Idaho fescue	<i>Festuca idahoensis</i>		x
Fumitory	<i>Fumaria officinalis</i>	x	
Prairie smoke	<i>Geum triflorum</i>		x
Curly cup gumweed	<i>Grindelia squarrosa</i>	x	
Broom snakeweed	<i>Gutierrezia sarothrae</i>	x	
Foxtail barley	<i>Hordeum jubatum</i>	x	
Black henbane	<i>Hyoscyamus niger</i>	x	
Poverty weed	<i>Iva axillaris</i>	x	
Rocky Mountain juniper	<i>Juniperus scopulorum</i>	x	x
Kochia	<i>Kochia scoparia</i>	x	
Prairie junegrass	<i>Koeleria macrantha</i>		x
Prickly lettuce	<i>Lactuca serriola</i>	x	
Lappula	<i>Lappula redowskii</i>	x	
Spike fescue	<i>Leucopoa kingii</i>		x
Matrimony vine	<i>Lycium barbarum</i>	x	
Black medic	<i>Medicago lupulina</i>	x	

Common Name	Scientific Name ¹	Alder Gulch Mine Site	RWHR Site
Alfalfa	<i>Medicago sativa</i>	x	
White sweetclover	<i>Melilotus alba</i>	x	
Yellow sweetclover	<i>Melilotus officinalis</i>	x	
Evening star	<i>Mentzelia decapetala</i>	x	
Small-flowered mentzelia	<i>Mentzelia dispersa</i>	x	
Leafy wildparsley	<i>Musineon divaricatum</i>		x
Prickly pear cactus	<i>Opuntia polyacantha</i>	x	x
Indian ricegrass	<i>Oryzopsis hynenoides</i>	x	
Western wheatgrass	<i>Agropyron smithii</i>		x
Reed canarygrass	<i>Phalaris arundinacea</i> L.	x	
Timothy	<i>Phleum pratense</i> L.	x	
Phlox	<i>Phlox</i> spp.		x
Plantain	<i>Plantago major</i>	x	
Kentucky bluegrass	<i>Poa pratensis</i>	x	
Narrowleaf cottonwood	<i>Populus angustifolia</i>	x	
Bluebunch wheatgrass	<i>Agropyron spicatum</i>		x
Antelope bitterbrush	<i>Purshia tridentata</i>		x
Prickly gooseberry	<i>Ribes setosum</i>	x	
Prickly rose	<i>Rosa acicularis</i>	x	
Sandbar willow	<i>Salix exigua</i>	x	
Russian thistle	<i>Salsola tragus</i>	x	
Goldenrod	<i>Solidago gigantea</i>	x	
Needle and thread grass	<i>Stipa comata</i>	x	
Dandelion	<i>Taraxacum officinale</i>	x	x
Thermopsis	<i>Thermopsis montana</i>	x	
Red clover	<i>Trifolium pratense</i>	x	
White clover	<i>Trifolium repens</i>	x	
Common mullein	<i>Verbascum thapsus</i>	x	
Verbena	<i>Verbena bracteata</i>	x	
Death camas	<i>Zigadenus</i> sp.		x

¹ (Lesica, 2012)

Noxious Weeds

Noxious weeds are species, brought from other countries that aggressively colonize disturbed sites and interfere with agriculture and reduce habitat values for wildlife. Weeds are assigned state priority levels or categories by County Weed Boards (Madison County, 2008; MSU Extension Service, 2010). Field studies conducted during the summer of 1991 and spring 2013 indicated several plants designated as "noxious weeds" under the County Noxious Weed Control Act (7-22-2101(5), MCA) occurred within the permitted areas. In 1991, noxious weeds observed on the Alder Gulch processing plant permit area were: spotted knapweed, Canada thistle, and whitetop. Spotted knapweed occurred throughout the permit area and was a dominant plant on some sites. Whitetop and Canada thistle occurred predominantly on the flat tailings area. In 2013, noxious weeds at the Alder Gulch processing plant location were spotted knapweed, common mullein, houndstongue, and Canada thistle. The 1991 field study did not include the RWHR site. In 2013, noxious weeds

observed in the RWHR area include spotted knapweed, hoary alyssum, houndstongue, and musk thistle (Babcock, 2013).

Garnet USA has filed a Noxious Weed Control Management Plan with the Madison County Weed Board.

Table 3.4-3. List of Weed Species Identified at the Alder Gulch Mine and RWHR Mine Sites, Madison County, Montana.

Common Name	Scientific Name	Priority Level/ Category	Alder Gulch Mine Site	RWHR Site
Houndstongue	<i>Cynoglossum officinale</i>	2B/ I	x	x
Hoary alyssum	<i>Berteroa incana</i>	2A/ I		x
Whitetop	<i>Cardaria draba</i>	2B/ I	x	
Musk thistle	<i>Carduus nutans</i>	MC	x	
Spotted knapweed	<i>Centaurea maculosa</i>	2B/ I		x
Canada thistle	<i>Cirsium arvense</i>	2B/ I	x	
Black henbane	<i>Hyocyamus niger</i>			x
Common mullein	<i>Verbascum thapsus</i>	MC	x	

Priority 2A: Common in isolated areas of Montana. Management criteria will require containment and suppression where common; and eradication, prevention, and education where less abundant. Management shall be prioritized by local weed districts (MSU Extension Service, 2010).

Priority 2B: Abundant in Montana and widespread in many counties. Management criteria will require containment and suppression where abundant and widespread; and eradication, prevention and education where less abundant. Management shall be prioritized by local weed districts.

Category I: Noxious weeds are weeds that are currently established and generally widespread in many counties of the state. Management criteria include awareness and education, containment and suppression of existing infestations and prevention of new infestations. These weeds are capable of rapid spread and render land unfit or greatly limit beneficial uses (Madison County, 2008).

MC: Identified as a weed by Madison County (Madison County, 2008).

Special Status Species

To determine the presence of Threatened or Endangered Plant Species (TES) the U.S. Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation System (IPaC) was queried in February of 2012 and again in June of 2013 for a current list of TES species within Madison County, Montana (USFWS, 2013). In addition a request was sent to the Montana Natural Heritage Program (MTNHP) for a list of Species of Concern and elemental occurrence map for the project area. Ute ladies-tresses (*Spiranthes diluvialis*) and whitebark pine (*Pinus albicaulis*) were identified as having potential to occur in Madison County. However, suitable habitat for these species is absent from the two permit areas. Ute ladies-tresses require moist meadows or riparian habitat at elevations between 4,300 and 6,850 feet. Populations of Ute ladies-tresses have been documented as recently as 2011 along State Route 287 approximately 2.5 miles northwest of the Alder Gulch permit area in riparian wetlands (MTNHP, 2013). However, the disturbed tailings areas within the permit

area are unlikely to provide habitat. Whitebark pine is found at high elevations and does not occur on the Garnet USA property.

3.5 Surface Water Resources

3.5.1 Overview and Analysis Area

The existing condition of surface water resources was evaluated for the Alder Gulch permit area and the proposed RWHR Mine site. Surface water bodies at and near the Alder Gulch site consist of Alder Gulch, groundwater-fed ponds that have formed in the placer tailings, and an unnamed stream along the northeast boundary of the permit area. The RWHR area is generally dry, with the exception of several ephemeral washes, and an intermittent stream that crosses the northeast corner of the permit area (Garnet USA, 2013).

The analysis area for the Alder Gulch site and the proposed RWHR Mine site was limited to the permit boundary and immediate vicinity. The local surface water hydrology of the Alder Gulch site has been modified by historic placer mining activities.

3.5.2 Methods

Existing surface water conditions were obtained from Garnet USA's 2013 operating permit amendment application and review of maps and aerial photographs. Information from Garnet USA's operating permit amendment application included results of recent field work conducted by Garnet USA at the proposed RWHR Mine site, and results of water resources data collected for the Alder Gulch permit area during previous permit applications. In addition, recent water level measurements, surface water, and groundwater sampling provides baseline data for inclusion in this EIS.

3.5.3 Results

Alder Gulch Permit Area

A water resources investigation conducted in 1990 and 1991 was provided in Garnet USA's current amendment application. New surface water resource studies were conducted in spring 2013 for this operating permit amendment application. Baseline conditions evaluated in this EIS are representative of conditions at the Alder Gulch site during 1990-1991 and 2013.

The Alder Gulch processing plant permit area is located on tailings from historic dredge mining of Alder Gulch Creek. These mining activities have modified Alder Gulch Creek's natural channel such that Alder Gulch Creek infiltrates into the tailings inside the permit boundary and re-emerges as discharge from the tailings near the northwest corner of the permit boundary. In addition to discontinuous remnants of Alder Gulch Creek, ponds located below the water table are common within the permit area. In addition, an unnamed creek flows along the northeastern permit boundary. Studies completed during 1990–1991 suggested that Alder Gulch Creek is a gaining stream east of the permit area and a losing stream in the southern portion of the permit area. The unnamed stream is likely a losing stream for its entire course through the permit area (Garnet USA, 2013a).

Flow measurements conducted during 1990 and 1991 suggest that the highest flows on both streams occur during spring and early summer in response to snowmelt and precipitation events. However, Garnet USA's operating permit amendment application indicates that no historic flood frequency information exists for Alder Gulch Creek (Garnet USA, 2013a). Flood magnitude events have not been calculated.

Chemical quality of surface water was monitored twice during 1990 and 1991, before and after small-scale test mining operations were carried out at the site, and then again in June 2013. The 1990 and 1991 data were provided in the operating permit amendment application. The operating permit amendment application suggests that additional monitoring continued after the initial 1990 and 1991 monitoring; however, no results or further details from this subsequent monitoring program were provided (Garnet USA, 2013). The more recent sampling occurred after submittal of the operating permit amendment application to provide recent water quality results.

Eleven sites located across the Alder Gulch permit area were monitored during 1991 and 1992 and three sites in 2013 for a suite of parameters including: common ions, selected metals, nitrogen, turbidity, total dissolved solids, pH, specific conductivity, and other parameters. The 2013 sampling included analysis for volatile and semi-volatile organics. The 1991 and 1992 monitoring sites were located on the unnamed stream along the northeastern boundary of the permitted area, along Alder Gulch Creek, and in ponds in the historic tailings (Figure 1.1-2). The 2013 samples were collected from SW-11 (northwestern location), SW-4, (southern location), SW-2, (eastern location of the permitted boundary).

Results of the 1991 and 1992 monitoring events were provided as attachments to the operating permit amendment application. Total dissolved solids (TDS) concentrations ranged from 180 milligrams per liter (mg/l) to 361 mg/l, and as noted in the operating permit amendment application appear to increase somewhat from east to west along Alder Gulch Creek. The highest concentration of TDS in Alder Gulch Creek was 361 mg/l at site SW-11, located at the northwest end of the permit boundary where Alder Gulch Creek emerges as surface flow from the historic tailings. To the east, TDS concentrations in Alder Gulch Creek were lower and ranged from 180 mg/l to 200 mg/l at sites SW-2 and SW-4. TDS concentrations in ponds fell within the range reported for the streams.

Nitrate concentrations were generally low, but also exhibited a modest increase from east to west along Alder Gulch Creek, ranging from around 0.05 mg/l to 0.17 mg/l, in both cases well below the EPA drinking water maximum contaminant level of 10 mg/l (EPA, 2013a). One sample from a pond had the highest reported nitrate concentration of 0.26 mg/l. Metal analytical results were typically not detected at concentrations above the laboratory reporting limits.

Results of 2013 surface water sampling are summarized below. TDS concentrations ranged from 140 (SW-2) to 280 mg/l (SW-11), showing the same trends of increasing concentrations from east to west as found in the 1991 and 1992 sampling results. Conductivity and pH also show similar trends. A maximum conductivity was 464

microSiemens/centimeter (uS/cm) at SW-11 and a minimum conductivity of 229 uS/cm at SW-2. The pH decreased from east to west with 7.88 at SW-11 and 8.20 at SW-2. Nitrites and nitrates were non-detectable at all three surface water locations. Metal analytical results were typically non-detectable or just above laboratory detection limits. No volatile or semi-volatile organic detections were reported. All results were compared to DEQ Circular 7 for aquatic and human health standards (DEQ, 2012). No exceedances were reported.

The Alder Gulch processing plant site was issued a Montana Pollutant Discharge Elimination System (MPDES) permit (No. MT-0029971) on November 1, 1997 (Garnet USA, 2013a). The MPDES program is designed to control point-source discharges of wastewater in order to maintain water quality in Montana, and does so primarily by requiring adherence to effluent limits and treatment standards through a mandatory permit program. The Garnet USA operating permit amendment application states that the current project does not involve the discharge of any pollutants to surface waters. An EPA Discharge Monitoring Report indicates that this MPDES permit expired on September 30, 2002 (EPA, 2011). That general MPDES Permit expired, the Alder Gulch site, operated by Ruby Valley Garnet at the time, had a General MPDES Sand and Gravel Discharge Permit. That permit was assigned to Garnet USA in 2012.

Garnet USA has three surface water rights on Alder Gulch Creek which are listed in Table 3.5-1. These rights are included in the operating permit.

Table 3.5-1. Garnet USA Surface Water Rights on Alder Gulch Creek.

Water Right No.	Rate (gpm)	Annual Volume (acre-feet)	Priority Date
41C 196461 00	12,000	Limited to volume historically used for mining	12/31/1899
41C 193858 00	1,500	Limited to volume historically used for mining	12/31/1899
41C 77973 00	2,050	1.61	7/22/1991

RWHR Mine Site

The operating permit amendment application identifies three drainages that partially traverse the proposed RWHR Mine site, including 1) an intermittent stream channel crossing the northeast corner of the permit boundary, 2) the middle drainage, an ephemeral channel that traverses east to west across the middle of the permit area, and 3) a south drainage, an ephemeral channel in the southwest quadrant of the proposed permit boundary (Figure 3.4-2). The presence of a large southern ephemeral drainage, about one-quarter mile southwest of the proposed permit boundary, was also noted in the operating permit amendment application (Garnet USA, 2013).

The Garnet USA operating permit amendment application states that “the RWHR Site is in a dry area with no perennial flowing water” (Garnet USA, 2013a). Due to the lack of observed surface water flow at the proposed RWHR Mine site, Garnet USA did not collect any flow or surface water quality data at the site. Garnet USA indicated in their operating permit

amendment application that stream flow monitoring could be conducted if flows were observed and monitoring was considered necessary by DEQ.

The intermittent channel has some stockwater developments upstream of the permit area and is the same channel that is actively mined to the northwest at the previously permitted Red Wash Alluvial site. A segment of this intermittent channel (1,000 feet or less) within the proposed permit area exhibits a “concentration of growth” characterized as “enhanced habitat” in the operating permit amendment application.

In addition to the information provided by Garnet USA, aerial photographs obtained from Google Earth were reviewed for evidence of surface water and shallow groundwater. Examination of these aerial photographs suggests that springs discharge into intermittent drainage tributaries near the proposed RWHR Mine site. Reaches of these tributary channels, particularly to the southeast, but outside, of the proposed RWHR Mine site, exhibit notable areas of vegetation compared to the surrounding terrain, further suggesting that surface water and/or shallow groundwater is consistently present in some of these nearby channels.

3.6 Groundwater Resources

Groundwater resources are described as subsurface water flowing through the porous spaces in soils or bedrock. Groundwater eventually discharges at the surface as springs, seeps, wetlands, or surface water bodies. The following section discusses existing groundwater resources in the vicinity of the Alder Gulch and RWHR Mine permit areas. An analysis of groundwater resources requires understanding the physical movement, the volume, and the chemical characteristics of groundwater, as well as the characteristics of the aquifer(s) that contain groundwater.

3.6.1 Overview and Analysis Area

As discussed in Section 3.2, the Alder Gulch permit area is located in Alder Gulch in the Ruby River valley. The proposed RWHR Mine site is located over 600 feet higher in elevation and about 4.5 miles to the southeast of the Alder Gulch site on bedrock-dominated uplands above the valley bottoms. These two types of environments are typically associated with different groundwater systems. The Alder Gulch system is dominated by the alluvial aquifer underlying the Ruby River valley, whereas groundwater near the proposed RWHR Mine site is dominated by a bedrock aquifer system of unknown depth and extent and possibly localized shallow groundwater systems accompanying intermittent or ephemeral drainage channels.

The groundwater resource analysis area for the Alder Gulch permit area includes the active permit area and approximately 3,000 feet on the east and west sides of the permit area. This analysis area encompasses the current permitted area, the majority of the historically disturbed placer tailings area, most of the village of Alder, and extends over one mile hydrologically down gradient from the location of the Proposed Action. This area was

selected because it coincides with the extent of groundwater monitoring data collected during the 1990 and 1991 studies.

The groundwater resource analysis area for the proposed RWHR Mine site includes the proposed RWHR permit area as well as approximately one mile around the proposed permit area. This area was selected because 1) groundwater resources do not appear to be heavily utilized in the vicinity of the proposed RWHR Mine site, 2) shallow groundwater, if present, likely exists only in localized systems associated with drainages, and 3) the Ruby Valley is located 1.5 miles to the west and represents a different hydrogeologic regime from the one in which the Proposed Action would occur.

3.6.2 Methods

Existing groundwater resources were evaluated primarily from information contained within Garnet USA's operating permit amendment application (Garnet USA, 2013a). For the Alder Gulch site, the operating permit amendment application document provided baseline water resource study completed during 1990 and 1991 (Garnet USA, 2013a). A groundwater resource study was completed in spring 2013 and provided additional groundwater quality and water level data in support of the operating permit amendment application (Garnet USA, 2013d). The MBMG Groundwater Information Center (GWIC) was consulted for additional information on local groundwater wells (GWIC, 2013). Monitoring sites are shown on Figure 3.6-1.

3.6.3 Results

Alder Gulch Permit Area

The Alder Gulch processing plant site overlies an alluvial aquifer that has been dredged during historic placer mining activities. Prior to mining, Alder Gulch Creek alluvium consisted of a mixture of clay, silt, sand, gravel, cobbles, and boulders. The redeposited tailings consist of mounds of coarse-grained alluvium underlain by moderately- to well-sorted finer-grained sand and gravel. Locally, the lowermost sand and gravel consists of up to 15 percent fine-grained sand and silt-sized material. These redeposited sediments are underlain by a hard clay layer locally referred to as "false bedrock", which marks the base of the alluvial aquifer, and the base of historic mining operations. Drilling in the area suggests that the false bedrock horizon ranges from 20 to 55 feet thick and possibly greater thicknesses at the Alder Gulch site (Garnet USA, 2013a).

Monitoring wells were installed at the Alder Gulch site in 1991, and aquifer tests were conducted on several wells. The alluvial aquifer had a calculated hydraulic conductivity between 1,400 gallons per day per square foot (gpd/ft²) and 3,000 gpd/ft², which indicates a permeable aquifer capable of rapidly transmitting large volumes of groundwater.

Groundwater measurements collected in June 2013 suggests the depth to groundwater below ground surface (bgs) ranges from 9.6 to 16.8 feet in the plant area to 45.7 feet bgs along the far western boundary. (Garnet USA, 2013d). A partial hydrograph (water level record) from well MW-1 (recording data from May 1990 to October 1991) was provided in

the operating permit amendment application. This hydrograph suggests that seasonal high groundwater levels occurred during spring and early summer.

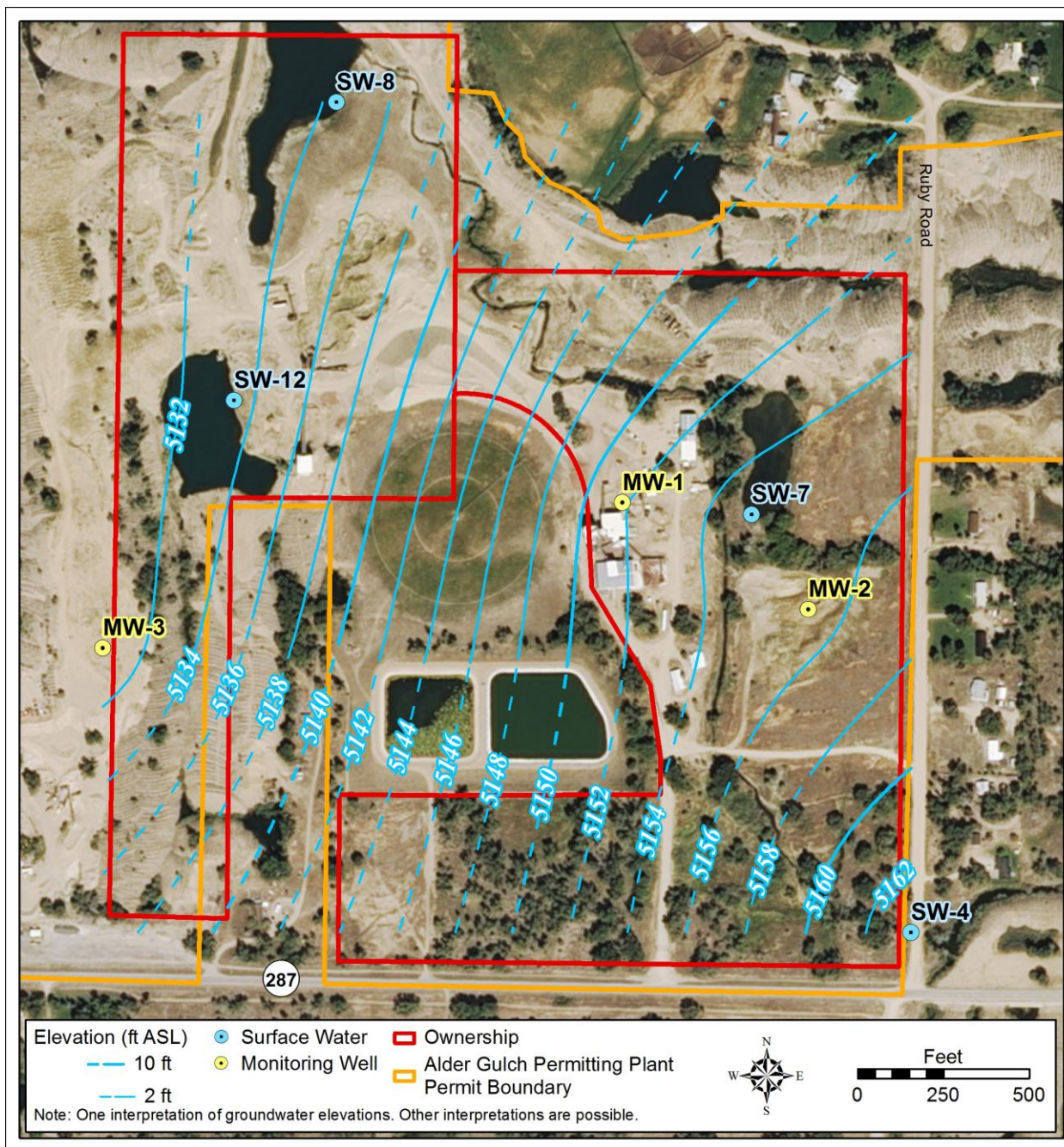


Figure 3.6-1. Groundwater Elevation Contour Map for the Alder Gulch Mine Permit Area.

The timing of seasonal low groundwater levels is less clear due to the incomplete hydrograph record. Garnet USA stated in the operating permit amendment application that annual water table fluctuation in the Alder Gulch area is less than 3.5 feet, which is consistent with the data included in the partial MW-1 record.

A groundwater contour map, which graphically displays the elevation of the water table, was prepared from data collected on June 5, 2013 (Figure 3.6-1). This contour map indicates that at the time the data were collected, groundwater was flowing generally from the southeast to the northwest and joins the Ruby Valley alluvial system near the western portion of the site.

The average groundwater gradient (change in groundwater table elevation per unit of horizontal distance) was reported to be approximately 0.013 feet per foot (Garnet USA, 2013a). Based on the hydraulic conductivity and gradient data, and an estimated aquifer porosity of 0.35, the average groundwater velocity in the alluvial aquifer beneath the Alder Gulch site is approximately 7.5 feet per day.

Groundwater quality data was provided by Garnet USA from samples collected from nine wells during 1991–1992 and three wells in June 2013. The more recent sampling occurred after submittal of the operating permit amendment application to provide recent water quality results. The operating permit amendment application provided the 1991-1992 groundwater water quality results, and states that the following:

- The chemical composition of groundwater is similar to that of surface water,
- Groundwater is hard (contains relatively high concentrations of calcium and magnesium compounds),
- Total dissolved solids range from 300 milligrams per liter (mg/l) to 550 mg/l,
- Dissolved metals concentrations were less than or slightly above laboratory detection limits, and
- Turbidity levels (a measure of water clarity) ranged from 2 nephelometric turbidity units (NTUs) to 16 NTUs in domestic wells.

Results of the recent 2013 monitoring event are summarized below. TDS concentrations ranged from 160 mg/L (MW-1) to 220 mg/L (MW-3) with concentrations similar to surface water. The total hardness for the groundwater ranged from 130 to 170 mg/L and is classified as hard water. A maximum conductivity of 383 microSiemens/centimeter (uS/cm) was measured at MW-3 and a minimum conductivity of 269 uS/cm was measured at MW-1. The pH ranged from 7.17 (MW-2) to 8.36 at MW-1. Nitrites and nitrates were non-detect at MW-2 and MW-3. At MW-1, nitrites were non-detect but nitrate was detected at 0.191 mg/L just above the laboratory detection limit of 0.18 mg/L. Metal analytical results were typically non-detect or just above laboratory detection limits. No volatile or semi-volatile organic detections were reported from MW-2. There were several detections of organics reported in MW-1 and MW-3 but just above detection limits. MW-1 reported tetrachloroethylene (PCE) concentrations of 0.57 micrograms/Liter (ug/L) and a reporting limit of 0.5 ug/L. MW-3 reported concentrations of Bis(2-ethylhexyl)phthalate at 3.7 ug/L (detection limit of 2 ug/L) and Iodomethane concentrations of 1 ug/L (detection limit of 1 ug/L). All results were compared to DEQ Circular 7 for surface water and groundwater human health standards. There were no exceedances of these standards.

There are three existing ponds, the North Pond, the West Pond, and the East Pond, within the Alder Gulch permit area (Figure 1.1-2). Historically, the North Pond (2.9 acres) and the West Pond (2.1 acres) were major sources of process water for the processing plant needs. Currently the West Pond is the primary source of water for the process water as the makeup balance for the operations. The East Pond (1.1 acres) is silted with fine material and at most holds a few feet of water.

RWHR Permit Area

Few data are available for characterizing groundwater conditions in the vicinity of the proposed RWHR Mine site. One privately-owned domestic groundwater well (GWIC #211478) appears to be located less than one mile from the proposed site boundary (GWIC, 2013; Garnet USA, 2013). Records indicate that this well is 39 feet deep and has a static water level of 7 feet (GWIC, 2013). Garnet USA's operating permit amendment application states that the well was inaccessible during site reconnaissance; therefore, no field data for this well are available.

Garnet USA drilled two groundwater exploration test holes at the proposed RWHR Mine site using a blast hole drill rig. The holes were identified as TH-1 and TH-2, and each was drilled to a total depth of 72 feet below ground surface, and both holes were reported to be dry. Using a map provided in Garnet USA's operating permit amendment application, the surface elevations of TH-1 and TH-2 were estimated to be 5,740 and 5,700 feet, respectively (Garnet USA, 2013a). The elevation at the bottom of each test hole was estimated to be 5,668 feet for TH-1 and 5,628 feet for TH-2. Based on these estimated elevations, TH-2 appears to have been drilled to a depth below that of the proposed quarry floor elevation of 5,650 feet, whereas TH-1 was terminated approximately 18 feet above this level.

On the basis of these dry test hole results, Garnet USA states that "the mining operation will be dry and completely above the groundwater table and will have negligible impacts on groundwater levels and quality" (p. 35). For this reason, no wells were completed at the proposed RWHR Mine site (Garnet USA, 2013a). Garnet USA proposes to complete additional investigations at the RWHR Mine site to verify the absence of groundwater.

However, some evidence exists suggesting that the proposed RWHR permit area is not entirely devoid of groundwater, and the information provided in the operating permit amendment application leaves some questions unanswered. Specifically:

- The presence of a shallow domestic well (GWIC #211478) within one mile of the proposed site suggests that shallow groundwater exists, at least locally, in the general vicinity of the RWHR Mine site.
- Review of aerial imagery of the intermittent channel that crosses the northeast corner of the site suggests that shallow groundwater may exist in the vicinity of this channel, and that groundwater springs may discharge into the channel, particularly upstream of the RWHR Mine site.

- The results of the two test holes presented in the operating permit amendment application represent a snapshot of subsurface conditions at the site. Test holes which are not cased and subsequently monitored may not indicate a groundwater system in low permeability or fractured rock.

Conventional baseline groundwater monitoring using wells installed at selected locations and depths would be required to more definitively establish whether groundwater is present at the proposed RWHR Mine site, and if so, its chemical, physical, and temporal characteristics.

3.7 Hazardous Materials

Hazardous material at the Alder Gulch processing plant would be mainly associated with operation and maintenance of equipment and may exert a hazardous characteristic as a result of its composition.

3.7.1 Overview and Analysis Area

The current Alder Gulch processing plant uses various fluids for use as fuel, lubricants, coolants, and other maintenance activities which may have hazardous characteristics. These materials have the potential to impact storm water, surface water, and local air quality. These materials are located at the Alder Gulch processing plant and would be located at the proposed RWHR Mine site in the fuel and lubricant storage areas and septic systems.

3.7.2 Methods

Garnet USA's operating permit, Spill Prevention, Control, and Containment (SPCC) plan, Storm Water Pollution Prevention Plan (SWPPP) discussion for the proposed RWHR Mine site, Present Permit and Proposed Amendment, and its current Air Quality Permits (#28828-03 and #4842-00 – Approved April 3, 2013) outline potential sources of storm water and surface water pollution as a result of current processing and proposed mining activities and are described below.

3.7.3 Regulatory Environment

Some hazardous materials must be handled under the Resource Conservation and Recovery Act (RCRA). This act regulates the hazardous waste from "cradle to grave". However, specific wastes associated with mining, albeit exhibiting hazardous characteristics may be exempted from RCRA regulation. These materials are addressed in Section 3.2 Geology and Waste Rock Geochemistry and Sections 3.6 and 3.7, Surface Water and Groundwater.

In October, 1980, RCRA was amended with the Bevill exclusion, to exclude "solid waste from the extraction, beneficiation, and processing of ores and minerals" from regulation as hazardous waste under Subtitle C of RCRA. Specific requirements for waste materials for exclusion must be mineral processing wastes which are generated by operations downstream of beneficiation and originate from a mineral processing operation based on

being a solid waste as defined by EPA, uniquely associated with mineral industry operations, and must originate from mineral processing operations (EPA, 2012).

Fuels, motor oils, lubricants, and other hazardous materials hauled by truck must be transported to and from the site via public roads under the Department of Transportation requirements which include driver training and registration, inspections, manifesting (shipping papers), approved containers, with labeling and placarding requirements primarily under Title 49 CFR (MDT, 2011).

If storm water is allowed to leave the site, an industrial storm water discharge permit may be necessary; however, if all storm water is to remain onsite, DEQ may require department approval of the Industrial No Exposure Certification Form for exclusion from MPDES Storm Water Discharge Permitting for specified industrial activities. Waste or materials which may impact storm water or surface water are addressed in the SWPPP as part of the Notice of Intent to be covered under the Statewide General Storm Water Permit as required by ARM Title 17.30.1101 – Storm Water. Petroleum, oils, and greases which may impact surface waters are covered under the SPCC plan if required by 40 CFR Part 112.2.

The SWPPP outlines measures to be implemented to reduce impacts to water quality as a result of construction or industrial activities. It is associated with the Storm Water Permit as required under ARM Title 17.30.1101. The SPCC plan requires implementation of measures for oil spill prevention, preparedness, and response to prevent oil discharge to navigable waters. An SPCC plan is required for sites storing petroleum volumes greater than 1,350 gallons in containers holding 55 gallons or more in areas with the potential to reach navigable waters of the United States as required by 40 CFR Part 112.2. There are no plans to exceed these storage levels at the RWHR Mine site, but an SPCC plan will be prepared by Garnet USA prior to start-up as needed to comply with 40 CFR Part 112.2 (Garnet, 2013a; Garnet 2013e).

Septic systems must be permitted through Madison County to ensure that there is no transmission of diseases. A permit ensures safe treatment and disposal of all wastewater to protect public health and the environment, and that it will not violate other laws or regulations governing water pollution or wastewater disposal (Madison County Board of Health, 2006).

3.7.4 Results

Hazardous materials which have the potential to be present at the site are identified. Two types of waste which have the potential to be hazardous and could be generated at the facility would include potential RCRA wastes and septic wastes. These materials are discussed below.

Potential RCRA Wastes

Some materials may be hazardous as products, but as wastes, these materials may be regulated under RCRA as hazardous waste. Based on review of the documents referenced

above regarding current materials located at the two sites, the following materials were noted:

- Lubricating Oils/Waste Oils
- Antifreeze
- Diesel Fuel/Gasoline 2-10,000 gallon tanks

Fuel, including diesel and gasoline, lubricating oils, and antifreeze are stored onsite at the processing plant. Fueling and servicing of equipment are completed using leak proof fueling hoses and servicing procedures. Fueling and major servicing of vehicles and equipment only occur at designated areas using a five-ton truck containing fuels and lubricants. Fuel is obtained from the pumping station equipped with overhead piping to a concrete self-contained pumping station for equipment fueling.

Fuel storage facilities are constructed of non-permeable, leak proof concrete containment of at least twice the total storage capacity. The bulk lubricant storage facilities at the shop site have a concrete, leak proof containment of double the storage capacity which functions in conjunction with the waste oil containment facility associated with the shop operation. The garnet sand concentration process does not involve the use of process chemical agents.

RWHR Site

There is no fuel storage proposed at the RWHR Mine site. All fuel for equipment would be brought in daily as needed. There is no process chemical storage or wastes at the proposed site at this time.

Septic Waste

Septic waste can have hazardous characteristics, but disposal is not regulated under RCRA. Septic systems are designed with potential demand requirements and are required to have approval from the county. The Alder Gulch processing plant site has a septic system that was approved by the Madison County Sanitarian as part of the initial permit (Garnet USA, 2013). Permitting assures that the septic design has met county requirements for the disposal of septic wastes.

3.8 Air Quality

The air quality of a region is primarily controlled by the type, magnitude, and distribution of pollutants and may be affected by regional climate. Transport of pollutants from their source areas are affected by topography and meteorology.

3.8.1 Overview and Analysis Area

The Proposed Action would occur under the current Montana Air Quality Permits (MAQP) #28828-03 and 4842-00 issued April 3, 2013 by the DEQ Air Resources Management Bureau. Sources of potential air quality impacts exist at the proposed RWHR Mine site where a majority of the activities would occur. The permit allows portable operation of crushing/screening activities, diesel generators, and material handling; however, the air

quality analysis area for this evaluation is focused on the initial proposed project area under the current air quality permit located in Section 10, Township 6 South, Range 4 West, Madison County, Montana. In addition, whole rock chemistry analysis was completed to evaluate the potential for asbestiform minerals.

3.8.2 Methods

Air quality for the project area was described as part of the MAQP #4842-00 issued April 3, 2013, and the Garnet USA operating permit application which incorporates regional climate and areas of concern, emission sources, types (fugitive or point source) quantities, and a projected ambient air quality evaluation.

3.8.3 Results

The existing air quality and climatic conditions in the vicinity of the Proposed Action are detailed below. It consists of a discussion of conditions which may affect regional air quality and the existing air quality in the affected area.

Topography

The Alder Gulch processing plant and the proposed RWHR Mine site lie between the Tobacco Root Mountains to the north, Gravelly and Greenhorn Ranges to the east, and the Ruby Range to the west (Garnet USA, 2013). The premining topography in the proposed RWHR Mine site is generally moderately steep in the east and falls in elevation sloping downward somewhat to the northwest (Garnet USA, 2013).

Climate and Meteorology

The area surrounding the Alder Gulch processing plant and the proposed RWHR Mine is characterized by a dry, mild continental climate. Generally, average daily temperatures are moderate, rarely falling below 0° Fahrenheit (F) or rising above 90°F.

Typically, fall and winter seasons are dry and the late spring and early summer produce the greatest percentage of the precipitation. Snow pack normally peaks in early April and is absent by late May. Rain falling on snow causes runoff events that are typical in late winter and early spring. Figures 3.8-1, 3.8-2 and 3.8-3 show the temperature and precipitation data that most closely match the Alder Gulch and the RWHR Mine sites.

Historical climate data specific for the Alder Gulch permit area and the RWHR Mine were not available through the National Oceanographic and Atmospheric Administration's (NOAA) National Weather Service (NWS). Below is a table of the NOAA stations closest in elevation and proximity to the permit areas.

Table 3.8-1. NOAA Stations Most Indicative of Permit Areas Climate

NOAA Station	Proximity	Elevation (ft amsl)	Years of Operation	Average Annual Precipitation
Alder Ruby Dam	8 Miles south	5611	1981-1993	13.76
Alder 17S	17 Miles south	6204	1956-2007	13.10
Alder 19 S	15.3 Miles south	6098	2009-current	11.23*

*Average annual precipitation calculated on the only two years of complete data, 2009 and 2012.

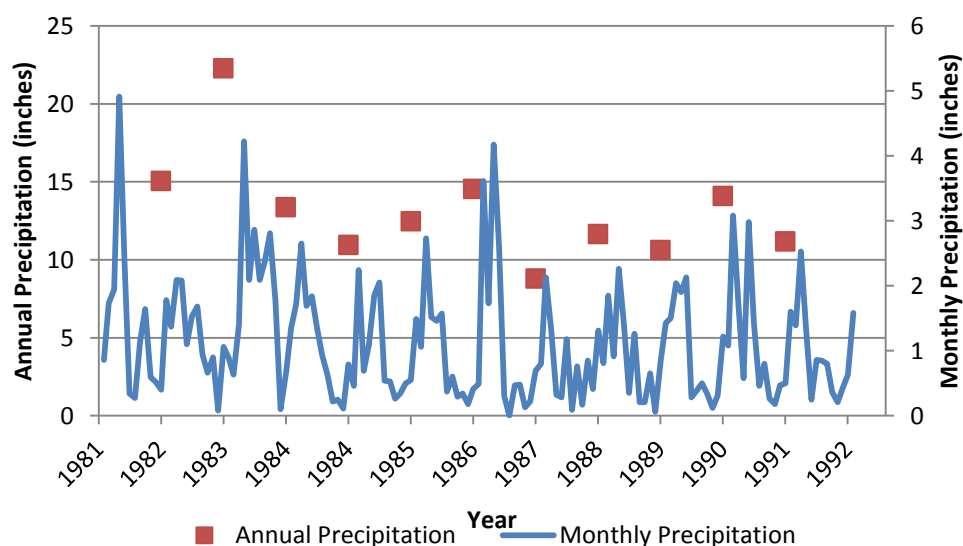


Figure 3.8-1. Precipitation Data (1981-1993) for the Ruby Dam NOAA station

The precipitation data for the Ruby Dam area were collected from January 1981 through March 1993. Figure 3.8-1 displays the annual precipitation totals in red, on the left axis, and monthly precipitation totals in blue, on the right axis. Elevation of the Ruby Dam Station is similar to that of the project area, but the Ruby Dam station site is shielded to the west by the Ruby Range in contrast to the open range typical of the project area. Monitoring ceased at this station in 1993.

The precipitation data for the Alder 17 S station were collected from October 1956 through January 2008 (Figure 3.8-2). The period graphed has been truncated to make it more comparable to the data for the Ruby Dam station shown in Figure 3.8-1. The monthly

precipitation totals are shown in blue, on the left axis, and annual precipitation totals are shown in red, on the right axis.

Statistical projections of precipitation from the Alder 17 S station database indicated that two years in ten received less than 9.42 inches and another two years received more than 15.90 inches of annual precipitation. The average number of days that were likely to receive more than 0.10 inches of precipitation during the year was 34, or less than ten percent of days in a year. The highest projected number of days receiving more than 0.10 inches of precipitation within a particular month was six for both May and June.

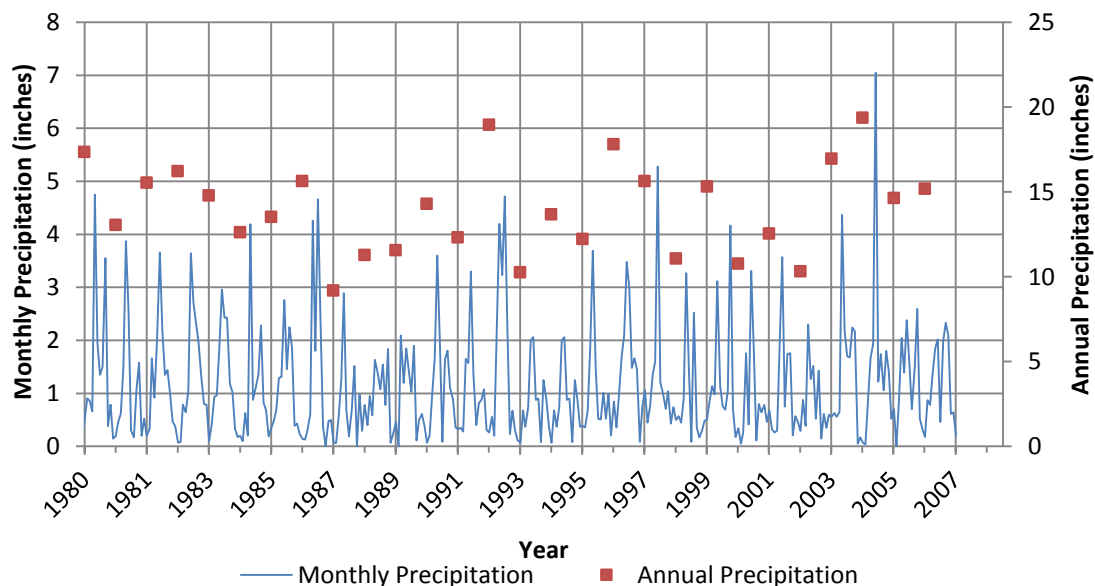


Figure 3.8-2. Annual and Monthly Precipitation Data (1957-2007) Alder 17S NOAA Station

Statistical projections of temperatures from the Alder17S station showed two years in ten had maximum temperatures greater than 92°F and another two years in ten saw minimum temperatures less than - 27°F (Figure 3.8-3). During the period from November to March, average minimum temperatures during any of these months fell below 0°F two years out of 10.

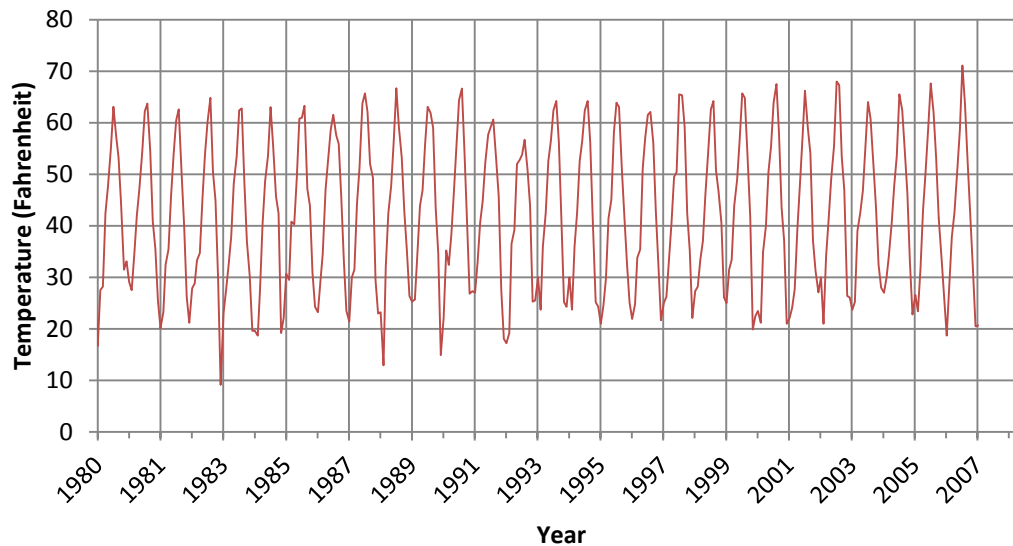


Figure 3.8-3. Monthly Mean Temperature Data (1957-2007) Alder 17 S NOAA Station.

3.8.3.3 Regulatory Environment

The Clean Air Act, which was last amended in 1990, requires EPA to set National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for pollutants considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. The standards or limits based on human health are called primary standards. The limits intended to prevent environmental and property damage are called secondary standards. A geographic area with air quality that is cleaner than the primary standard is called an "attainment" area; areas that do not meet the primary standard are called "nonattainment" areas. Designation of a nonattainment area is a formal rulemaking process under the EPA only after air quality standards have been exceeded for several consecutive years (DEQ, 2011).

Asbestiform minerals, in their fibrous, airborne form, have potential to be hazardous to human health through inhalation and can be found in certain geologic materials. Although there is no general ban on the use of asbestos, EPA primarily regulates the material with the National Emission Standards for Hazardous Air Pollutants (NESHAP) and DEQ under the Asbestos Control Act. Some of its many uses have been banned by the Toxic Substances Control Act (EPA, 2013b; DEQ, 2013).

The EPA Office of Air Quality Planning and Standards has set NAAQS for six principal pollutants, which are called "criteria" pollutants. These are particle pollution (often referred to as particulate matter (PM)), ground-level ozone as measured by volatile organic compounds (VOCs), which is necessary in the formation of ozone, carbon monoxide (CO), sulfur dioxides (SO₂), nitrogen oxides (NO_x), and lead (Pb) (EPA, 2010). The NAAQS set the absolute limit for criteria air quality pollutants. Montana has adopted additional state air

quality standards known as the Montana Ambient Air Quality Standards (MAAQS). The Proposed Action must demonstrate continued compliance with all applicable state and federal air quality standards.

The 1990 Clean Air Act amendments require large stationary sources of air pollution to obtain air quality permits. There are two different permitting programs for these sources which include the Title V Operating Permit program and the New Source Review (NSR) program. All major sources, those that have a potential to emit (PTE) greater than 100 tons per year (TPY) of any air pollutant, greater than 10 TPY for any hazardous air pollutants as listed in EPA's Section 112(b)1 Hazardous Air Pollutants (HAPS) or greater than 25 TPY for any combination of HAPS have requirements under the EPA's Title V and NSR programs (EPA, 2007). The Title V program requires major sources to obtain a permit that consolidates all Clean Air Act requirements for the facility into one document and provides for public participation. The NSR program requires that major sources install the most stringent pollution control technology. All major sources within an attainment area would be required to have a Prevention of Significant Deterioration (PSD) increment evaluation under the federal NSR regulations (DEQ, 2011).

Projects subject to PSD must also demonstrate the use of Best Available Control Technology (BACT) and show that combined impacts from all PSD sources would not exceed allowable increments in air quality for NO₂, SO₂ and particulate matter – 10 micron (PM₁₀) which includes particles with a diameter of 10 micrometers or less (EPA, 2011). BACT is based on the maximum degree of control that can be achieved. It is a case-by-case decision that considers energy, environmental, and economic impact. BACT can be add-on control equipment or modification of the production processes or methods. BACT may be a design, equipment, work practice, or operational standard if imposition of an emissions standard is infeasible.

Existing Air Quality

Baseline air quality measurements were not made in the vicinity of the Alder Gulch, Red Wash Alluvial, or RWHR Mine sites. The nearest known air quality measurements were made at two talc mines south of Ennis, Montana. These measurements, however, were not representative of the Alder, Montana area. There were no significant air pollution sources in the Alder Gulch, Red Wash Alluvial, or RWHR project areas.

The Alder Gulch area was considered as attaining or being unclassified for all criteria air pollutants. The nearest non-attainment area is the Butte area, located approximately 50 miles northwest of the project area. The project area was also designated as a Class II area under the PSD regulations. The nearest Class I area is Yellowstone National Park, located approximately 50 miles southeast of the project areas.

On March 7, 2012, materials were sampled from surface outcrops, test pits, and exploration trenches from each lithology proposed to be encountered. No obvious asbestiform minerals were observed during the collection of the samples. Each sample was analyzed for

asbestiform fibers using EPA Method 600/R/93/116 with CARB TM 435. All analytical results were reported as non-detected (Garnet USA, 2013).

The air quality permit #2888-03 for the processing plant was transferred to Garnet USA on March 25, 2012 and an updated revision was approved May 12, 2012 (Garnet USA, 2013). A modification application was made to the existing air quality permit to add the crushing circuit and equipment at the mine site on November 29, 2012. The permit for the crushing circuit is air quality permit #4842-00. The modifications were designed to include initial and future operation at the plant. The permit #4842-00 was issued on February 13, 2013 and finalized on April 3, 2013 (DEQ, 2013a).

The permit (#4842-00) for the crusher circuit covers fugitive emissions, those which could not reasonably pass through a stack, chimney vent, or other functionally-equivalent opening (40 CFR Sections 70.2 & 71.2), and point source emissions, those that are released from a single point. Fugitive emissions evaluated for the current air quality permit included the following: crushing, screening, material transfer including pile forming, loading and unloading, and haul roads. Point source emissions include exhaust stack emissions from diesel-fired engine generators.

Garnet USA has accepted federally enforceable permit operating limits to be considered a minor source for emissions. The location of the proposed activities has been designated as unclassified/attainment with all ambient air quality standards, meaning there is not an immediate concern with respect to the area's ambient air quality, and there are no major air pollution sources in the surrounding areas. The permit covers the plant while operating at any location in Montana with several exceptions where those areas having a DEQ approved permitting program, are considered tribal land, or areas in or within 10 kilometers (km) (6.2 miles) of designated particulate matter PM₁₀ nonattainment areas.

The current air quality permit contains an air quality analysis of the proposed Garnet USA Mine Project. DEQ has determined that impacts from the current permitting action would be minor and not expected to cause or contribute to a violation of any NAAQS or MAAQS or opacity requirements and would have minimal effect on the air quality of the project area. (DEQ, 2013a).

3.9 Power Supply

3.9.1 Overview and Study Area

Both the Alder Gulch processing plant and the proposed RWHR Mine site would require electrical power to run equipment and lighting. The Alder Gulch processing plant is not proposing to add substantially to its current power usage.

3.9.2 Methods

Materials and background information were researched using the Garnet USA operating permit (Garnet USA, 2013).

3.9.3 Results

A 3-phase, 4-wire configuration distribution line capable of supplying 7,200 volts (to ground) and 12,470 volts (phase to phase) is located along Ruby Road within approximately 1,000 feet of the main Alder Gulch processing facility that serves customers along the county road (Garnet USA, 2013). NorthWestern Energy has distribution power lines running west from Ruby Road to the adjacent processing plant facilities and another distribution power line running north from Highway 287 to the plant facilities west of the Alder waste water treatment plant. These power lines serve customers and landowners on both sides of the plant.

The proposed RWHR Mine site is isolated from any conventional power and gas and would derive energy from a diesel powered generator on the site. If the power cables for the generator are run above ground they would be protected by required Mine Safety and Health Administration (MSHA) safety features from damage (Garnet USA, 2013). If the power cables are run underground, they would be removed with a backhoe or excavator at the end of the mine life.

3.10 Noise

3.10.1 Overview and Study Area

At the Alder Gulch processing plant, previously permitted noise sources include haul trucks, offloading, diesel-powered heavy equipment, wet processing (i.e., jigs, spirals, tables, etc.), drying, and bagging equipment. Other intermittent existing noise sources include wind, aircraft flying overhead, birds, insects, vehicles traveling on nearby roads, including Ruby Road (eastern and northern boundary of the site) and Highway 287 (southern boundary), the City of Alder wastewater facility operations (mid site), and the Smail's Gravel Pit with crusher and conveyor operations (southwest of the site). Noise-sensitive receptors include residences to the east along Ruby Road, residences located northeast of the site, residences, and the Kamgrounds of America (KOA) Campground along Highway 287 southwest of the site. The processing plant was last operational in 2010 until process plant testing began again in 2013. Since the spring of 2012, there have been daily operations moving gravel and dirt on the site (Garnet USA, 2013).

The RWHR site is located in open rangeland, approximately 4.5 miles southeast of the Alder Gulch site. Exploration activities are intermittent at the site, and noise sources include diesel-powered heavy equipment, blasting, and traffic on ranch roads and Anderson Lane. Other existing noise sources include aircraft flyovers, wind, wildlife, birds, insects, etc. The closest residence to the RWHR site is located approximately 1.2 miles west and downslope of the site. Several rural residences are also located along the haul route along Anderson Lane between the RWHR site and State Route 287.

3.10.2 Methods

The noise assessment relied on published noise levels for noise sources and ambient conditions (Harris, 1998; Fidel, 1983; FTA, 2006; BSA, 2005; BSA, 2008). Existing noise levels at the Alder Gulch and RWHR sites have not been measured (McCullough, 2013)

Noise levels predictions at receptor locations due to equipment and operations, except haul truck traffic, were estimated according to the calculations of the International Organization for Standardization (ISO) Standard 9613-2, Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation (ISO, 1996). These calculations conservatively assume that atmospheric conditions are favorable for noise propagation, but atmospheric conditions can vary dramatically at large distances between a noise source and a receptor. Therefore, the predicted noise levels should be assumed to be average noise levels, and temporary significant positive and negative deviations from the averages can occur (Harris, 1998).

Haul truck noise level predictions were made using the Federal Highway Administration (FHWA) approved Traffic Noise Model (TNM), Version 2.5 software program.

Background

Noise is generally defined as unwanted sound, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels heard by humans and animals are dependent on several variables, including distance and ground cover between the source and receiver and atmospheric conditions. Perception of noise is affected by intensity, frequency, pitch and duration, and a person's attitude toward the noise source.

Noise levels are quantified using units of decibels (dB). Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies. The "A-weighting" of noise levels, or A-weighted decibels (dBA), closely correlates to the frequency response of normal human hearing (250 to 4,000 hertz [Hz]). Decibels are logarithmic values, and therefore, the combined noise level of two 50 dBA noise sources is 53 dBA, not 100 dBA.

Noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled, depending on the characteristics of the source and the conditions over the path that the noise travels. The reduction in noise levels can be increased if a solid barrier or natural topography is located between the source and receptor.

For environmental noise studies, noise levels are typically described using A-weighted equivalent noise levels, L_{eq} , during a certain time period. The L_{eq} metric is useful because it uses a single number, similar to an average, to describe the constantly fluctuating instantaneous noise levels at a receptor location during a period of time, and accounts for all of the noises and quiet periods that occur during that time period.

The ambient noise at a receptor location in a given environment is the all-encompassing sound associated with that environment, and is due to the combination of noise sources from many directions, near and far, including the noise source of interest. The 90th percentile-exceeded noise level, L_{90} , is a metric that indicates the single noise level that is exceeded during 90 percent of a measurement period although the actual instantaneous noise levels fluctuate continuously. The L_{90} noise level is typically considered the ambient noise level, and is often near the low end of the instantaneous noise levels during a measurement period. It typically does not include the influence of discrete noises of short duration, such as bird chirps, dog barks, car horns, a single blast, etc. If a continuous noise is audible at a measurement location, typically it is that noise that determines the L_{90} of a measurement period even though other noise sources may be briefly audible and occasionally louder than the equipment during the same measurement period.

The day-night average noise level, L_{dn} , is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. The L_{dn} can be determined using 24 consecutive one-hour L_{eq} noise levels, or estimated using measured L_{eq} noise levels during shorter time periods. The L_{dn} includes a 10 decibel penalty that is added to noises that occur during the nighttime hours between 10:00 p.m. and 7:00 a.m., to account for people's higher sensitivity to noise at night when the background noise level is typically low. Because it represents a weighted average noise level during a 24-hour period, the L_{dn} is not effective for describing individual or intermittent noise events, such as a single blast.

Large amplitude impulsive sounds, such as blasting, are commonly defined using the unweighted instantaneous peak noise level, L_{pk} . L_{pk} represents the highest instantaneous noise level during a certain time period, and the units of L_{pk} are unweighted peak decibels (dB). L_{pk} is used to assess blast noise because A-weighting underestimates the human annoyance caused by these low frequency impulsive sounds (USACHPPM, 2005).

Regulatory Environment

Madison County and the State of Montana do not have noise ordinances or regulations to limit the noise levels of mine or processing operations. However, excessive noise can be considered a public nuisance according to Montana Code, if the noise "endangers safety or health, is offensive to the senses, or obstructs the free use of property so as to interfere with comfortable enjoyment of life or property by an entire community or neighborhood or by any considerable number of persons" (45-8-1(11), MCA).

As a result of the Noise Control Act of 1972, the EPA developed acceptable noise levels under various conditions that would protect public health and welfare with an adequate margin of safety. The EPA identified outdoor L_{dn} noise levels less than or equal to 55 dBA are sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use (EPA, 1979). Although the EPA guideline is not an enforceable regulation, it is a commonly accepted target noise level for environmental noise studies.

No regulations limit the blasting noise produced by the Proposed Action, but the U.S. Army has determined an approximate level associated with human annoyance to blast noise. In general, L_{pk} 115 dBP at a listener location represents the threshold of annoyance for people, and below this level, there is a low risk of noise complaints (USACHPPM, 2005).

The Montana Department of Transportation (MDT) determines traffic noise impacts based on the noise levels generated by peak-hour traffic. The MDT criteria states that traffic noise impacts occur if predicted one-hour $L_{eq}(h)$ traffic noise levels are 66 dBA or greater at a residential property during the peak traffic hour, or if the projected traffic noise levels exceed the existing peak hour $L_{eq}(h)$ by 13 dBA or more (MDT, 2011a).

In addition to the absolute impact limits defined by EPA, MDT, and the U.S. Army, changes in noise levels are used to determine noise impacts and gauge community response (Egan, 1988). A change of 0 dBA is typically imperceptible and a 3 dBA is typically barely audible, which would result in no noise impact. A change of 5 dBA is clearly noticeable, and would be a moderate impact. A 10 dBA change is typically considered to be twice as loud as the existing conditions, and considered a significant impact.

3.10.3 Existing Noise Levels

Alder Gulch Processing Plant

When the Alder Gulch processing plant was last operational full time in 2010, the noise levels at the nearby residences were influenced by the onsite equipment and operations. Noise from an enclosed processing plant is typically about L_{eq} 63 dBA at 450 feet away, which includes diesel equipment and trucks coming and going from the building (BSA, 2005), and the residences located to the east and northeast of the site are approximately 1,300 to 2,400 feet from the plant. Therefore, the noise of the processing plant was approximately L_{eq} 42 to 48 dBA at the residences, and continuous processing activities between 7:00 a.m. and 5:00 p.m. would have been approximately L_{dn} 43 to 46 dBA at the residences, which is less than the EPA guideline of L_{dn} 55 dBA (EPA, 1979).

The noise of the diesel equipment working on the site since spring 2012 is difficult to quantify. Although typical diesel-powered equipment is L_{eq} 85 dBA at 50 feet away (FTA, 2006), the equipment is mobile over a large area, and operates intermittently. Therefore, the equipment noise levels at the residences vary widely from day to day.

When there are no processing activities and the diesel equipment is operating far from a residence, the ambient noise levels surrounding the Alder Gulch site are estimated to be approximately L_{90} 35 dBA and L_{dn} 40 dBA, which is typical for sparsely-populated, rural locations (Harris, 1998).

RWHR Mine Site

Exploration activities at the RWHR site are intermittent, and include diesel-powered equipment, a rock drill, blasting, and hauling the bulk sample to the Alder Gulch processing plant along Anderson Lane. Typical diesel-powered equipment is L_{eq} 85 dBA at 50 feet away, and a rock drill is L_{eq} 98 dBA at 50 feet (FTA, 2006). Therefore, when exploration

activities occur, the diesel equipment noise is predicted to be approximately L_{eq} 30 dBA, and the rock drill noise approximately L_{eq} 43 dBA at the closest residence located 1.2 miles west. Therefore, the existing L_{dn} at the residence is predicted to be approximately L_{dn} 41 to 43 dBA if the diesel equipment and rock drill operate continuously for all 10 hours between 7:00 a.m. and 5:00 p.m. on weekdays (Garnet USA, 2013a), which is less than the EPA guideline of L_{dn} 55 dBA (EPA, 1979).

Blast noise is calculated based on the weight of explosive used for each delay (Fidel, 1983). For the exploration activities, the maximum charge per delay is approximately 44 pounds (Garnet USA 2013a), and therefore, the predicted blast noise level is approximately L_{pk} 103 dBP, which is less than the U.S. Army L_{pk} 115 dBP threshold for annoyance (USACHPPM, 2005).

Near the RWHR site and along Anderson Lane, the existing ambient noise levels are estimated to be approximately L_{90} 35 dBA and L_{dn} 40 dBA, when exploration activities are not occurring, which is typical for sparsely-populated, rural locations (Harris, 1998).

Back-Up Alarms

Because of their intermittent, high-pitched, impulsive sound, back-up alarms can cause high levels of annoyance and numerous complaints even at noise levels equal to or less than the ambient noise levels at a listener location. However, back-up alarm noise has little influence on L_{eq} or L_{dn} values. Federal regulations indicate that backup alarms shall be audible above the surrounding background noise level near the equipment, but does not specify a particular noise level (MSHA, 2011).

Manufacturer published back-up alarm sound levels can vary between a maximum noise level of 90 and 110 dBA at 4 feet away, depending on the volume setting, model, working environment, etc. Although the back-up alarm noise varies widely at the residences near the Alder Gulch site as equipment moves around the site, the noise is expected to exceed and be clearly audible compared to the existing ambient noise levels. At the residence closest to the RWHR site, the back-up alarm noise may be equal to or less than the existing ambient levels, but may be still audible.

Haul Trucks

Hauling for the exploration work typically involves four to eight truckloads per day between 7:00 a.m. and 5:00 p.m. (Garnet USA, 2013). The residences located along Anderson Lane are approximately 160 to 200 feet from the road, and traffic travels at approximately 30 mph. Therefore, the predicted haul truck traffic noise during exploration work is approximately $L_{eq}(h)$ 38 to 40 dBA, which is less than the MDT $L_{eq}(h)$ 66 dBA traffic noise impact criterion (MDT, 2011).

During exploration, haul trucks are entering the Alder Gulch site by moving north from Anderson Lane and across Highway 287 to Ruby Road, travel approximately 900 feet north on Ruby Road, and turn onto the East Road into the site. Residences along Ruby Road between Highway 287 and the East Road are approximately 200 feet from the road.

Therefore, the predicted haul truck traffic noise on Ruby Road during exploration work is approximately $L_{eq}(h)$ 38 dBA, which is less than the MDT $L_{eq}(h)$ 66 dBA traffic noise impact criterion (MDT, 2011a).

3.11 Cultural Resources

Alder Gulch, in the vicinity of Virginia City, was one of the early placer gold mining camps in Montana where an estimated \$30,000,000 worth of gold was recovered during the initial gold rush of the 1860's. An additional \$9,000,000 in gold was recovered from the gulch in the vicinity of Alder, including the processing plant site, by a succession of dredges operated by the Conrey Placer Mining Company during the first two decades of the twentieth century.

The Alder dredge piles have been previously recorded and their significance assessed in terms of the National Register of Historic Places (GCM Services 1989). The permit area is outside of the Virginia City Historic Landmark District, but has important historical, economic, and geological connections with Virginia City, Montana.

3.11.1 Overview and Study Area

The area of potential effect for the alternatives under consideration includes the areas within the permit boundaries for the proposed RWHR Mine site and the Alder Gulch processing plant.

3.11.2 Methods

A historical inventory and assessment of the Alder Gulch permit area was conducted by the permit holder as a portion of the project's baseline environmental investigations in 1990. The objective of the inventory and assessment was to document historic activity which may have taken place on the permit area, to document the existing cultural environment prior to the proposed mining disturbance, and to assess the proposed disturbance in the context of historic placer and dredge mining. This assessment covered much of the permit boundary, and extended beyond the boundaries of the processing facility.

In June 2012, DEQ conducted a Class III cultural resources inventory at the proposed RWHR Mine site.

3.11.3 Results

Alder Gulch Processing Plant

Historic features and artifacts were found at three locations at or near the Alder Gulch permit area. Two of the features were felt to be of historic significance, either individually or in terms of the historic mining district. The remains of the No. 4 Conrey Dredge were located adjacent to the Alder KOA Campground, and is outside of, but immediately adjacent to the permit boundary. The permit activities provided maintenance of the setting and associations of this feature within the mining plan by avoiding the feature and leaving an unmined buffer zone of high tailings around the eastern periphery of the dredge pond.

The remains of the No. 2 Conrey Dredge, built in 1901, are in a pond on the permit area's northern border in the eastern edge of Section 10, Township 6 South, Range 4 West. This feature is near the old Virginia City Road, and is inside the permit area. The previously submitted permit provided for maintenance of the setting and associations of this feature in the mine plan by avoiding the feature and leaving an unmined buffer zone immediately adjacent the feature.

The former Alder headquarters for the Conrey Placer Mining Company was located at the former town site of Ruby, immediately adjacent to the north boundary of the central portion of the permit area. The complex was last used by the Conrey Company in 1915, and has remained in an excellent state of preservation. While intimately associated with the Alder dredges and their resulting dredge piles, the site was separated in its purpose, which was administration, maintenance, and retorting of the amalgam from the dredges. The current owner was aware of the historic resource, and was largely responsible for the site's unusually high degree of integrity. The site; however, was not disturbed by the permitted activities, and the current owner does not wish to have the property listed on the National Register of Historic Places.

RWHR Mine Site

No historic properties were found, nor was there any evidence of cultural properties within the area of potential effect during the July 2012 pedestrian survey conducted by DEQ (Sears, 2012). The area has been used for cattle grazing and there was no evidence of structures or artifacts on the ground surface.

The cultural resource examinations were completed in a manner to satisfy federal and state regulations requiring cultural resources inventory in compliance with Section 106 of the National Historic Preservation Act (Public Law 89-665, as amended); Executive Order 11593 (Protection and Enhancement of the Cultural Environment); the National and Montana Environmental Policy Acts, and other state and federal legislation.

3.12 Socioeconomics

3.12.1 Overview and Study Area

The discovery of gold in Virginia City in the 1850's resulted in a rapid migration of miners and associated tradesmen into the area. Although the rich placer gold deposits upstream from Virginia City were depleted during the following decade, placer and lode mining continued on a relatively large scale until 1922. Since then, intermittent mining activities in the general area have continued to the present on a much smaller scale.

From 1899 to 1922, approximately two square miles of the Alder Creek drainage within the immediate vicinity of Alder were mined by large scale dredging operations to recover placer gold from alluvial sands and gravels. The previous holder of the operating permit proposed to placer mine and reprocess these dredge tailings left from this historic mining. Following the end of the major mining activity in the Alder area near the beginning of this century, farming and ranching became the primary and basic industries characterizing the area. The

past construction of the Ruby Reservoir Dam south of Alder resulted in a large expansion of irrigation systems which provide water for ranch lands in the Ruby River Valley. Today, cattle and alfalfa hay are the principal agricultural products of the area.

Tourism and recreational opportunities have become a major factor in the socioeconomic structure of the Alder and Ruby River Valley area. Hunting and fishing, along with nearby Yellowstone National Park, the historic reconstruction of Nevada City, and preservation of Virginia City, all contribute to these opportunities.

Limited local goods and services are provided in Alder, Montana. Other nearby communities of Sheridan, Virginia City, Twin Bridges, and Ennis offer additional goods and services. Major regional retail centers nearest the Alder area include Butte (approximately 65 miles), Dillon (approximately 48 miles), and Bozeman (approximately 78 miles). Socioeconomic analyses are focused on the area surrounding Alder, but some statistics are available only for larger communities in Madison County.

3.12.2 Methods

Statistical information used in the following sections to document and describe the socioeconomics and human environment of the Madison County, Montana area was obtained from the US Census and other governmental databases available on-line (US Census Bureau, 2012; IES, 2012; US Dept. of Commerce, 2013). The low population density in Madison County and Alder limits the amount of community-specific statistics available.

3.12.3 Results

Population and Demographics

The 2010 National Census recorded a Madison County population of 7,691 persons. In 2012 the population estimate increased by 82 persons or approximately one percent (US Census, 2013). Madison County was one of the top ten fastest-growing counties in the state from 2000 to 2010, with a population increase of 12.3 percent (MT DLI, 2012). Table 3.12-1 provides available population statistics for communities in Madison County and demographic data for the county as a whole.

Table 3.12-1. Census and Demographic Data for Madison County, Montana

Population (count)		
	2010	2012
Madison County	7,691	7,733
Alder	103	105
Ennis	838	853
Virginia City	285	196
Sheridan Town (CCD) ¹	642 (1,718)	651
Twin Bridges Town (CCD)	375 (1,514)	382

Gender – Madison County		
	2010	2012
Male (%)	52	52
Female (%)	48	48
Percent Race – Madison County		
	2010	2012
White	96.8	98.1
Native American	0.5	0.5
Hispanic	2.4	1.4
Other	0.3	0.0
Age Groups (count) – Madison County		
	2010	2012
Under 18	1,364	1,491
18-44	2,508	1,848
45-64	2,207	2,775
65 or older	1,612	1,612
Sources: (US Census Bureau, 2012; US Census, 2013)		
¹ CCD: Census County Division- Areas designated by the Census Bureau for presenting decennial census statistics in areas with lower population density.		
Note: Column sums for groups reflect questions answered and may not match County totals due to individual census completion.		

Housing: Quantity and Distribution

The 2010 housing census reported 807 occupied housing units in Sheridan, of which 588 are owner occupied and 219 are renter-occupied. 257 vacant housing units were identified in Sheridan. Across Madison County, there are approximately 6,580 housing units of which 3,672 are occupied. The overall 2010 Madison County rental vacancy rate was estimated at 12.3 percent (US Census Bureau, 2012). Specific housing data are not available for Alder.

Social and Governmental Services

Hospitals or medical centers near Alder, Montana include:

- Ruby Valley Hospital- provides emergency services 9 miles away in Sheridan
- Barrett Memorial Hospital- provides emergency services 35 miles away in Dillon
- St. James Healthcare- provides emergency services 51 miles away in Butte, MT

Emergency response and services are dispatched out of the Madison County Communication Center in Virginia City, Montana. Madison County Communication Center supplies local communication and dispatch services for local police, fire emergency medical, and search and rescue agencies. Madison is a rural county, but social services such as community centers, counseling, child care, and elder care are available at the larger population centers such as Dillon and Sheridan.

School System

An elementary school system at Alder provides education for children in kindergarten through eighth grade. The school has three classrooms and a small gymnasium which also serves as a town meeting hall and school auditorium. The school was designed to serve a capacity enrollment of 60 students and 3 teachers. Enrollment in 2011 was 24 students served by 2 teachers (IES, 2012).

Madison County has an "open" enrollment policy whereby students may choose their schools. About 12 students of elementary age from Alder attended schools in the Sheridan School District during the 2011 school year. Madison County provides bus service for these students.

Sheridan schools include a kindergarten through eighth grade elementary school and a high school in adjoining buildings. The elementary school has a capacity of about 206 students, and registered an enrollment of 106 in 2011. The high school has a capacity of 130 students, and had a 2011 enrollment of 76 students (IES, 2012). Alder, Montana, is included in the Sheridan High School District. For comparison, the Ennis School District served approximately 328 students at three schools in grades kindergarten through 12th grade in the 2011-2012 school year (Table 3.12-2).

Law Enforcement and Fire Protection

Law enforcement services within Madison County are provided by the Madison County Sheriff's Department. The Sheriff's Department consists of a sheriff, an undersheriff, and five deputies and radio operators. Two law enforcement personnel are on duty, with one officer patrolling the area west of Virginia City, and one officer patrolling the area east of Virginia City.

The Alder Volunteer Fire Department had 17 local volunteer members. Mobile response units are located at Alder, Montana, and include one pumper truck with a 500 gallon tank and a 300 gallon per minute (gpm) pump, a water tender with a 1,000 gallon tank and a 100 gpm pump, and a Montana Department of Natural Resources and Conservation fire truck with a 250 gallon tank and a 100 gpm pump.

The Sheridan Volunteer Fire Department consisted of 28 local volunteers and six mobile response units, including a service truck, two wildfire pumpers, one fire truck with a 1,000 gallon tank and a 1,000 gpm pump, and two fire trucks with 500 gallon tanks and 500 gpm pumps. Although the local fire control district extends to the community of Laurin about two miles north of Alder, the Sheridan Fire Department is available by request to assist in responding to local fire protection needs. The Alder and Sheridan fire control areas maintain a Mutual Fire Aid Agreement.

Sanitation

Alder has a municipal wastewater system. Individual wells provide domestic water to the businesses and residents. Individual homes and businesses are responsible for providing their own water via domestic wells.

Madison County owns and operates solid waste landfill sites near Ennis and Twin Bridges. A solid waste collection facility (green boxes) for the Alder area is located in the southwest portion of the existing dredge tailings about one-half mile east of Alder. The Madison County Sanitarian reports no current problem with capacity at the county's landfill sites. Special arrangements, including payment of additional fees, would have to be made with the County Sanitarian if large quantities of solid waste were proposed for disposal at the Alder collection site.

Employment and Income

Employment across Madison County is diverse and the top ten private industry employers in the county include three resorts, a mine, local hospitals, a grocery, and a fly-rod manufacturer (MT DLI, 2012). Average wage per worker and annual employment data for representative industry categories Madison County, Montana for 2009 and 2010 are provided in Table 3.12-3.

Table 3.12-3. 2009 and 2010 Average Wages per Job and Annual Employment, Madison County

Industry	2009		2010	
	Wage	Employees	Wage	Employees
All Industries	\$27,220	3,584	\$29,022	3,322
Mining	\$58,718	74	\$60,930	51
Construction	\$33,690	351	\$30,592	341
Manufacturing	\$25,273	77	\$24,378	87
Transportation/ Warehousing	\$32,696	85	\$34,227	84
Wholesale Trade	\$35,493	32	\$39,870	27
Retail Trade	\$21,230	217	\$21,823	212
Finance /Insurance/Real Estate	\$36,781	155	\$35,450	154
Government	\$30,453	521	\$30,701	528
Health Services	\$34,517	154	\$34,543	152
Accommodations and Food Service	\$19,373	949	\$20,517	885
Source: Montana Department of Labor and Industry				

The median family income in Madison County in 2011 was \$45,242 (US Census, 2013). Per capita income in 2011 was \$35,281 (Table 3.12-4). The total civilian labor force for Madison County in 2009 was estimated to be 4,171, of which 94.2 percent were employed. In 2010, the labor force decreased to 3,910 and unemployment increased to 7.5 percent (MT DLI, 2012). This trend is similar to overall nationwide trends in unemployment.

Table 3.13-2. District Information for Madison County Schools for the 2011-2012 School Year.

School Name	Full-time classroom teachers	Total Enrollment	Student teacher ratio	Title 1 (School Wide Program) ¹
Alder Elementary District				
Alder Elementary (kindergarten-8th grade)	1.9	24	12.63	Yes
Sheridan District				
Sheridan Elementary School (kindergarten-8th grade)	11.87	106	8.93	Yes
Sheridan High School (9th-12th grade)	9.73	76	8.06	Yes
Ennis Elementary and High School Districts				
Ennis Elementary (pre-K-6 th)	13	181	13.92	No
Ennis 7-8	3.14	47	14.97	No
Ennis High School (9th-12th grade)	8.79	100	11.4	No

Source: National Center for Education Statistics. Data for the 2011-2012 school year. <http://nces.ed.gov/ccd/districtsearch/>

¹Title I schoolwide programs serve schools where 40% or more of the enrolled population come from families living in poverty. Schoolwide programs serve all students within Title I schools regardless of individual income status.

Table 3.12-4. Per capita Personal Income for the United States, Montana, and Madison County from 2009 to 2011.

Year	United States	Montana		Madison County	
	Dollars	Dollars	% of US Avg	Dollars	% of Montana Avg
2009	\$ 39,635	\$ 34,828	87.8	\$ 33,196	99.5
2010	\$39,791	\$ 34,363	86.6	\$ 33,401	97.2
2011	\$41,560	\$ 36,016	87.0	\$ 35,281	99.5
2012	\$42,693	\$ 37,370	88.2	---	---

Source: US Department of Commerce, Bureau of Economic Analysis, CA1-3 - Per capita personal income 2/ <http://www.bea.gov/regional/reis/drill.cfm>

Industrial and Commercial Activities

Intermittent lode and placer gold mining operations have contributed to industrial activities in the Ruby Valley. Family ranching and farming activities predominated in the Ruby Valley area. In addition, seasonal tourism (Virginia City and nearby historic features) and recreational opportunities (hunting and fishing, sightseeing) contributed to local commercial activities. The *Madisonian* in Virginia City, Montana, publishes a weekly newspaper which provided coverage for the Ruby Valley Area. The US Department of Labor classifies jobs using the North American Industry Classification System (NAICS). Major industries use a two-digit code, and mining, quarrying, and oil and gas is classified as NAICS 21. Examples of other major industries include health services, transportation, construction, government, accommodations, and manufacturing.

The industrial and commercial activities for Madison County also pertain to the proposed RWHR Mine site. Agriculture, forestry, fishing and hunting, and mining are the main industrial employers but only account for four percent of industry in Madison County. Other major industries are construction (7%), educational, health and social services (5%) and arts, entertainment, recreation, accommodation and food services (31%) (US Dept. of Commerce, 2013). Employment in Madison County has shifted over the past few years sectors such as construction have lost jobs while service industry jobs such as accommodations and food service have increased (Table 3.12-5).

Table 3.12- 5. Employment by NAICS Industry (persons) for Madison County from 2009 to 2011.

Description	2009	2010	2011
Employment by place of work (number of jobs)			
Total employment	5,976	5,643	5,790
By type			
Wage and salary employment	3,813	3,565	3,700
Proprietors employment	2,163	2,078	2,090
Farm proprietors employment	471	466	464

Description	2009	2010	2011
Nonfarm proprietors employment	1,692	1,612	1,626
By industry			
Farm employment	615	615	631
Nonfarm employment	5,361	5,028	5,159
Private nonfarm employment	4,796	4,457	4,585
Forestry, fishing, and related activities	142	152	154
Mining	114	91	86
Utilities	13	13	13
Construction	652	616	413
Manufacturing	134	132	139
Wholesale trade	50	44	39
Retail trade	420	402	406
Transportation and warehousing	142	140	155
Information	18	18	18
Finance and insurance	149	153	151
Real estate and rental and leasing	321	302	303
Professional, scientific, and technical services	(D)	(D)	(D)
Management of companies and enterprises	(D)	(D)	(D)
Administrative and waste management services	197	180	186
Educational services	28	29	31
Health care and social assistance	211	209	204
Arts, entertainment, and recreation	618	499	547
Accommodation and food services	1,070	987	1,239
Other services, except public administration	303	299	311
Government and government enterprises	565	571	574
Federal, civilian	70	70	68
Military	38	38	39
State and local	457	463	467
State government	13	13	12
Local government	444	450	455

(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.

Source: Regional Economic Information System, Bureau of Economic Analysis, US Department of Commerce, <http://www.bea.gov/regional/docs/footnotes.cfm?tablename=CA05N>

Local and State Tax Revenues

Madison County, Montana and School District 2 valuations and revenues are shown in Table 3.13.-6. School District 2 serves the immediate Alder, Montana area and teaches students in kindergarten through 6th grade. The elementary school receives most of the available tax revenues. The amounts shown in Table 3.12-6 are approximate. The 2011 tax levy in the Alder tax district of Madison County was 443 mills.

Table 3.12-6. 2011 School District 2, Alder and Madison County Taxable Value and Revenues

Tax Entity	Taxable Value	Revenues
Madison County	\$74,186,637	\$24,106,387*
Alder Elementary School Dist.	\$1,484,796	\$1,323,000
*Estimated		

3.13 Transportation

3.13.1 Overview and Study Area

The main roadway servicing the Alder Gulch processing plant is State Route 287 which connects Alder on the west with Virginia City to the east. The roadway passes through Alder, and turns north toward Sheridan. Other roadways that would be driven by employees and contractors include Ruby Road, Anderson Lane, and private ranching roads. Of these, only State Route 287 is a paved road. Truck traffic related to the project would potentially affect other traffic on State Route 287 on the section between Alder and the entrance to the Alder Gulch processing plant. The study area for transportation includes this section of State Route 287 and the potential access roads for the Alder Gulch processing plant and the proposed RWHR Mine site.

3.13.2 Methods

Statewide traffic data from MDT annual counts for State Route 287 from Ennis to Alder were reviewed (MDT, 2012). Information on county and private roads was provided by Garnet USA in its operating permit (Garnet USA, 2013).

3.13.3 Results

All transportation of materials and personnel would occur on public and private roads. There are no plans to use rail transport to move ore or other project-related materials. Most employee transportation associated with the mining project is by personal vehicle. Employees park near the processing facility and would carpool to the mine site using company vehicles.

Construction and Operational Materials

All materials necessary for operation of the Alder Gulch processing plant access the project site from State Route 287. A main access road, the South Road, had been completed with appropriate right-of-way permits obtained from the MDT. All materials necessary for operation of the proposed RWHR Mine site would access the project site from State Route 287 to Anderson Lane, to a private ranch road for final access. A main access road has been completed with appropriate right-of-way permits obtained from MDT.

Access Roads

The main existing access road to the Alder Gulch processing facilities, the South Road, originates from State Route 287. The main access to the proposed RWHR Mine site is along Anderson Lane to an improved existing ranch access road.

All trucks and employee traffic would use State Route 287 in some capacity to reach one or both permit areas. Traffic data are summarized annually by MDT for several monitoring sites along State Route 287. These data are provided as Annual Average Daily Traffic or AADTs. Although traffic data are not available by month, it is generally accepted that the summer months have higher traffic counts due to heavy tourist traffic traveling between Ennis, Virginia City, Alder, and Sheridan, Montana. MDT Traffic Count Site 29-3-1 is less than one mile east of the Alder Gulch processing plant entrance on State Route 287 (MDT, 2012). Table 3.13-1 summarizes the AADTs for several traffic count sites along State Route 287 from just north of Alder (29-3-2) to where it intersects with US Highway 287 at Ennis (29-4-13). Traffic has declined on State Route 287 at all traffic count sites in the area from 2007 to 2011 by an average of 28 percent. MDT counted approximately 60 commercial trucks daily during their traffic counts for 2011 along State Route 287 at sites from Ennis to Alder.

Table 3.13-1. Annual Average Daily Traffic Counts for MDT Traffic Monitoring Stations in the Vicinity of the Garnet USA Project, Madison County, Montana.

MDT Site ID	Description	2007	2008	2009	2010	2011
29-3-6	Upper Ruby Road, West of Alder	540*	400	400	400	270
29-3-2	State Route 287 Northwest of Alder	1,610*	1,520*	1,480	1,360	1,260
29-3-1	State Route 287 East of Alder-Station closest to processing plant	1,230*	1,160*	1,110	1,080	960
29-4-6	State Route 287 W of Virginia City	1,470*	1,380	1,370*	1,380*	910
29-4-8	State Route 287 E of Virginia City	1,440*	1,360*	2110	2,120*	820
29-4-4	State Route 287 West of Ennis	1,780*	1,840	1,900	1900	1520
29-4-13	US Hwy 287 just N of Ennis	6,580	6,040*	6,320*	4,660	3,500

*estimated from previous year's data

Source: (MDT, 2012)

The section of the main RWHR Mine access, Anderson Lane, that is on the County Road is a wide gravel road and is well maintained. The private road has been maintained for hauling semi-trailers and stock equipment. The road has had many layers of gravel applied over the past several years and is in excellent condition. Garnet USA has assisted Madison County to widen and improve the road to accommodate the haul truck traffic with county approval.

3.14 Land Use and Recreation

Land use includes all types of commercial, municipal, and recreational activities and how they affect the character of an area as well as its ability to sustain these uses.

3.14.1 Overview and Study Area

The study areas include the established Alder Gulch processing plant, the proposed RWHR Mine site, their respective permit areas, and adjacent lands.

3.14.2 Methods

Materials provided in the operating permit were reviewed, aerial photos of the sites were examined, and land use data bases were consulted to determine the types and arrangements of land uses in the study area.

3.14.3 Results

Alder Gulch Permit Area

The Alder Water and Sewer District operates a wastewater facility on 18.5 acres adjacent to the Alder Gulch processing plant. The facility includes two lined holding ponds and a center pivot LAD area. Approximately 20 percent of the northwestern corner of the LAD is located on Garnet USA property. Wastewater from Alder is delivered to the treatment facility via a lift system and pipeline. The facility is in compliance with plans and specifications and recently passed a state compliance inspection (Bill Bahr, DEQ, pers. comm., July 2, 2013). The facility is estimated to be running at half capacity. Last year water in the ponds completely evaporated and land application was not necessary. A discharge permit is not required by DEQ. No yearly monitoring of water or soil quality is required or completed.

Public recreational opportunities within the permit area and immediately adjacent areas are limited as these lands are privately owned with access only by permission of the landowners.

All proposed activities within the permitted area are located entirely on private land owned by Garnet USA, LLC. Mineral rights are owned, leased, or available for lease by Garnet USA. Property boundaries and surface and mineral right holders are identified in Figure 2.4-1.

A small subdivision with several homes is located along the east side of the Ruby Road adjacent to the central portion of the permit area. The original site of the headquarters for the Conrey Mining Company was located a short distance north of the north-central portion of the permit boundary, and was historically referred to as the Ruby Village. This area also contained several homes, including those of two of the permit area landowners. Several homes are located immediately south of State Route 287 in the vicinity of the southwestern boundary of the permit area.

A gravel operation is maintained on the lands to the west of the Alder Gulch processing plant within the permit boundary. Gravel is mined from the tailings piles, sorted, washed,

and loaded onto trucks for distribution. MDT also maintains a shop and gravel source area just west of the permit boundary within the historic tailings piles.

A KOA camping facility is located adjacent the southwestern-most portion of the permitted area boundary. A small area of the dredge tailings piles adjacent to State Route 287 along the southern boundary of the permit area had been used by local individuals (with landowner permission) for obtaining small amounts of gravel and sand. The community of Alder, Montana, is located a short distance west of the KOA facility along State Route 287.

The area immediately south of State Route 287 and the permitted area boundary is characterized by flat tailings, and is used by a private landowner for livestock wintering and feeding. Other areas beyond the permit area boundary are used by private landowners for agricultural purposes, primarily hay production and livestock grazing. Landowner homes are widely dispersed in these areas. These areas are also interspersed with several irrigation canals. The Vigilante Canal, a major local irrigation canal providing water from the Ruby Reservoir, originates well south of the permitted area, flows north in an area east of the permit area and then northwestward along the bench land north of the permit area.

RWHR Permit Area

The RWHR is solely on privately owned lands and has restricted access for public recreation. The rangeland has historically been used for livestock grazing. The area also contains a previously permitted alluvial site (Red Wash) northwest of the proposed RWHR Mine site. There are no private residences or buildings within one mile of the proposed RWHR Mine site. Williams Creek-St-287-Adobetown Road is the only maintained dirt road within one-mile radius of the proposed RWHR Mine site. The road forks east off of Anderson Lane and travels through private and US Forest Service land to the northeast and ends at State Route 287 just northwest of Nevada City, Montana. Several unmaintained ranch roads are present within and surrounding the proposed RWHR Mine site.

Regional Land Uses

Madison County and the Ruby Valley, along with adjoining counties of Gallatin, Beaverhead, Silver Bow, and Jefferson offer a wide variety of seasonal public recreational opportunities. Major recreational opportunities within a one-hour drive of the permit area near Alder, Montana, included the following:

- Virginia City and Nevada City, along State Route 287 approximately nine miles west of the mine project area, recreates the historic era of the area with wooden sidewalks and authentic period shops, restaurants, and hotels. The Virginia City Player's Community Theater offers popular nightly melodrama and other theatrical productions during the summer season. A children's fishing pond is located among the placer tailings and a historic train travels between Nevada City and Virginia City.
- The Ruby River near Alder, south of the project area, offers public recreational opportunities (primarily sport fishing), but public access is limited as a result of private land ownership. Ruby Reservoir, about 10 miles south of Alder, offers

public access for boating and fishing activities, as well as rock-hounding for gem quality garnets and other minerals.

- The Madison River, east of Alder, and the Big Hole, Beaverhead, and Jefferson Rivers, west of Alder, offer excellent recreational activities, such as white-water rafting, kayaking, and sport fishing.
- Good roads and trails lead from the Ruby Valley area to adjacent national forest lands in the Tobacco Root, Ruby, and Gravelly Mountain Ranges. These areas offer opportunities for mountain biking, OHV's, gold panning, hiking and backpacking, fishing, hunting, horseback riding, and general sightseeing.

3.15 Visual Resources and Aesthetics

Visual resources are the visible physical features on a landscape (e.g., land, water, vegetation, animals, structures, and other features). The USDA Forest Service views landscape components of landform, vegetation types, and cultural modifications as the basis for the definition of visual resources. Existing or introduced visual resources may add or detract from the overall scenic quality or the visual appeal of a landscape.

3.15.1 Overview and Study Area

The areas studied for visual resources include the Alder Gulch processing plant, an established industrial site, and the proposed RWHR Mine site, which is surrounded by rangelands in the foothills of the Ruby Mountains.

3.15.2 Methods

A visual resources assessment was conducted using the Spatial Analyst extension in ArcGIS to perform a viewshed analysis of the proposed RWHR Mine site (Blocker, 2013). Google Earth along with project information such as pit location and the mining and milling waste rock stockpile were used to complete the visual analysis. Based on the initial Spatial Analyst results, five points were selected where the proposed RWHR Mine site was likely to be visible to the public.

3.15.3 Results

The Alder Gulch processing plant is in southwestern Montana in the eastern portion of the Ruby Valley, a large northwest to southeast trending valley bisected by the meandering Ruby River. The Ruby Valley is bounded on the north by the Tobacco Root Mountains and on the south by the Ruby Range.

The visual resources of the existing dredge tailings piles, characterizing much of the permit area, offer stark contrast to the adjacent irrigated valley farmland, and benches and foothills of the Tobacco Root and Ruby Ranges. For travelers on State Route 287 traveling eastward toward Nevada City and Virginia City, the high tailings piles in the western portion of the permit area provide the first indication of the major placer dredge mining activities that historically occurred in Alder Gulch. From State Route 287, the permit area provides a foreground visual resource. The dredge piles extend eastward through the permit area and along State Route 287 to Virginia City, a distance of approximately nine miles.

In the vicinity of the permit area, views of the full extent of the high dredge tailings piles to the north from State Route 287 are generally limited, as a result of the height of the tailings piles and the position of the highway. The greater amount of vegetation found on the flat tailings area (primarily large cottonwood trees) along the central portion of the permit area, and the more "jumbled" orientation of the tailings piles in the eastern portion of the permit area, do not provide the traveler along State Route 287 as great a visual contrast as found in the area of high tailings. The cottonwoods along State Route 287 near the entrance to the Alder Gulch processing plant shield much of the plant buildings and machinery from the public view.

RWHR Permit Area

The project area is located within an open rangeland setting with dispersed juniper and sagebrush vegetation. The predominant vegetation is shrub-steppe habitat type with a short segment of riparian in the northeast corner of the project area. The area appears mostly natural-looking to people traveling along Highway 287 and the Ruby Reservoir Road; however, much of the native vegetation has been modified due to extensive grazing. The open valley bottom and long sight distances allow travelers to see several miles across the rangeland, but the rolling hills also shield some areas from view. In the summer, green, irrigated fields stand out to the viewer in contrast to the grazed or open range non-irrigated areas which appear lighter in color.

3.16 Wildlife Resources

3.16.1 Overview and Study Area

Wildlife habitat in the vicinity of the permit area at the proposed RWHR Mine site is predominately arid, upland, montane sagebrush steppe and Rocky Mountain lower montane, foothill and valley grasslands. An unnamed intermittent stream passes through the northeast corner of the site and provides limited riparian habitat.

The Alder Gulch permit area consists of cleared industrial land with extensive historic tailings to the west. There are several open water ponds and isolated treed and shrubby areas interspersed with the industrial use activity. Wildlife habitat was assessed for the Alder Gulch processing plant area only.

3.16.2 Methods

Biologists with Montana Fish, Wildlife and Parks (MFWP) were contacted for information on wildlife issues related to the Proposed Action. Montana Natural Heritage Program information requests were submitted to determine known sensitive species presence within two miles of the proposed RWHR Mine site and the Alder Gulch processing plant. Surveys and other materials prepared as part of the operating permit amendment submittal were also reviewed and are summarized in this section. Surveys included an avian point count conducted in June 2013 and wildlife field observation study conducted in May 2013.

3.16.3 Results

Avian Surveys

Avian surveys were conducted in June 2013, at the proposed RWHR Mine site from midmorning to early afternoon and at the Alder Gulch processing plant in the midafternoon. Approximately 25 bird species were identified either by sight or by call. Identified bird species are listed in Table 3.16-1. No rare or special status species were observed during the 2013 avian counts. Nesting status for all species was not determined, although several species have the potential to nest in similar habitats. The RWHR Mine site is less than one-half mile from the reclaimed Red Wash Alluvial site and is expected to supply similar resources for birds found in the 2000 study. Juniper trees and sagebrush may provide nesting sites for several bird species within the RWHR Mine site (Garnet USA, 2013).

Table 3.16-1. Bird Species Identified by Song or Observation at the Alder Gulch and RWHR Permit Areas, Madison County, Montana.

Common Name	Scientific Name ¹	Migratory Species?	Status
American goldfinch	<i>Spinus tristis</i>	Y	
American kestrel+	<i>Falco sparverius</i>	Y	
American redstart	<i>Setophaga ruticilla</i>	Y	
American robin	<i>Turdus migratorius</i>	Y	
Bank swallow	<i>Riparia riparia</i>	Y	
Black-billed magpie	<i>Pica hudsonia</i>	Y	
Brewers blackbird	<i>Euphagus cyanocephalus</i>	Y	
Chipping sparrow*	<i>Spizella passerina</i>	Y	
Common nighthawk	<i>Chordeiles minor</i>	Y	
Dark-eyed junco	<i>Junco hyemalis</i>	Y	
European starling	<i>Sturnus vulgaris</i>	N	
Killdeer	<i>Charadrius vociferus</i>	Y	
Lark sparrow	<i>Chondestes grammacus</i>	Y	
Mountain bluebird	<i>Sialia currucoides</i>	Y	
Mountain chickadee	<i>Poecile gambeli</i>	Y	
Mourning dove	<i>Zenaida macroura</i>	Y	
Red-tailed hawk	<i>Buteo jamaicensis</i>	Y	
Red-winged blackbird	<i>Agelaius phoeniceus</i>	Y	
Sandhill crane (1 mile from riparian site)	<i>Grus canadensis</i>	Y	
Song sparrow	<i>Melospiza melodia</i>	Y	
Vesper sparrow	<i>Poecetes gramineus</i>	Y	
Western bluebird*	<i>Sialia mexicana</i>	Y	
Yellow warbler+	<i>Dendroica petechia</i>	Y	
Yellow-rumped warbler	<i>Dendroica coronata</i>	Y	
Great blue heron	<i>Ardea herodias</i>	Y	SOC
Bald eagle	<i>Haliaeetus leucocephalus</i>	Y	
Blue-winged teal	<i>Anas discors</i>	Y	
Wood duck	<i>Aix sponsa</i>	Y	
Mallard duck	<i>Anas platyrhynchos</i>	Y	

Common Name	Scientific Name ¹	Migratory Species?	Status
Canada goose	<i>Branta canadensis</i>	Y	
Great-horned owl	<i>Bubo virginianus</i>	Y	
Red-shafted flicker	<i>Colaptes auratus cafer</i>	Y	
Hairy woodpecker	<i>Picoides villosus</i>	Y	

+Species identified based on field notes, accuracy not guaranteed

*Species actively nesting on the site ¹ Nomenclature verified using (ITIS, 2013)

Birds observed in the existing Alder Gulch permit area included great blue heron, bald eagle, sandhill crane, blue-winged teal, wood duck, mallard duck, Canada goose, great horned owl, red-shafted flicker, hairy woodpecker, American robin, goldfinch, and black-billed magpie. Mallard, sandhill crane, black-billed magpie, hairy woodpecker, and great horned owl breed in the Alder Gulch permit area. One pair of sandhill cranes nested in cattails along the margin of a pond in the eastern portion of the permit area in 1991. According to local residents, at least six pairs of sandhill cranes established breeding territories around the periphery and in portions of the permit area.

A great blue heron rookery and several magpie nests were identified during the 2000 survey (Garnet USA, 2013). The rookery is located in the extreme northern part of the permit boundary on the eastern edge on the property within a number of cottonwoods. Several other stick nests were also located near the eastern edge of the property. Most of these nests were identified as magpie nests although there was a possibility of use by raptors in one location. All nests were protected with a minimum of a 200-foot no mine zone. No mining occurs within 500 feet of the nests or rookery during nesting season if the nests are found to be active.

Most species of birds, including eagles and other raptors, including owls, are protected under the Migratory Bird Treaty Act (16 U.S.C. 703). Bald eagles and golden eagles receive additional protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668).

Big Game

The Alder Gulch permit area is within Hunting District 320 of Region 3 in southwestern Montana. The most numerous big game animals in this hunting district are white-tailed deer, mule deer, and elk. However, habitat available in the permit area and associated placer dredge tailings is not typical of either Hunting District 320 or Region 3.

Big game occurring within the existing permitted area included resident populations of white-tailed deer, mule deer, and transient moose which occasionally move through the area. The topographic relief of the permit area tailings piles and dense shrub growth occurring in depressions between the tailings piles provides secure resting and feeding cover for deer. Deer rest and feed in the tailings area and forage in adjacent agricultural and riparian areas outside the existing permitted area. White-tailed deer periodically use portions of the permit area and adjacent lands year-round. Neither pronghorn antelope, nor black bear (*Ursus americana*) have been observed in the Alder Gulch area. An occasional elk and pronghorn antelope has been observed around the proposed RWHR Mine site.

Hollow cottonwood trees and snags in proximity to surface water and riparian communities within the permit area provided habitat for raccoon and cavity-nesting birds and mammals. Furbearers present in the permit area include beaver, muskrat, bobcat, raccoon, mink, skunk, and red fox. Beaver reside throughout the permit area and have colonized ponds in the tailings, constructing dams where surface water occurred along linear depressions in the tailings. Small mammals included deer mouse, meadow vole, and cottontail rabbit. In the 2000 survey, several other small mammals were identified including the least chipmunk, yellow-bellied marmot, snowshoe hare, red squirrel, pocket gopher, and an unidentified weasel.

Table 3.16-2. Wildlife Species Identified in the Vicinity of the Alder Gulch and RWHR Mine Permit Areas.

Common Name	Scientific Name ¹	Alder Gulch site	RWHR site
Raccoon	<i>Procyon lotor</i>	X	
Beaver	<i>Castor canadensis</i>	X	
Muskrat	<i>Ondatra zibethicus</i>	X	
Bobcat	<i>Lynx rufus</i>	X	
Mink	<i>Mustela vison</i>	X	
Skunk	<i>Mephitis mephitis</i>	X	
Red fox	<i>Vulpes vulpes</i>	X	
Deer mouse	<i>Peromyscus maniculatus</i>	X	
Meadow vole	<i>Microtis pennsylvanicus</i>	X	
Least chipmunk	<i>Tamias minimus</i>	X	
Yellow-bellied marmot	<i>Marmota flaviventris</i>	X	
Snowshoe hare	<i>Lepus americanus</i>	X	
Cottontail rabbit	<i>Sylvilagus nuttalli</i>	X	
Red squirrel	<i>Tamiasciurus hudsonicus</i>	X	
Pocket gopher	<i>Thomomys talpoides</i>	X	
Weasel	<i>Mustela spp.</i>	X	
Pronghorn antelope	<i>Antilocapra americana</i>		X
White-tailed deer	<i>Odocoileus virginianus</i>	X	X
Mule deer	<i>Odocoileus hemionus</i>	X	X
Elk	<i>Cervus elaphus</i>	X	X
Moose	<i>Alces alces</i>	X	

¹ Nomenclature verified using (ITIS, 2013)

RWHR Permit Area

The RWHR permit area is within Hunting District 330 of Region 3. Although the wildlife and big game species are similar to those occurring in the Alder Gulch permit area, District 330 has much lower population numbers than District 320.

The RWHR permit area lacks readily available water sources which several of the species found in Alder Gulch depend upon. Beaver, muskrat, and mink in particular are not likely to use the sagebrush steppe habitat at the proposed RWHR Mine site. Other furbearers or small mammals could pass through the proposed RWHR Mine site, but presence of ample

higher-quality habitat in and around the valley agricultural areas two miles away imply that wildlife density is likely to be lower at the RWHR permit area. Field observations at the RWHR permit area suggest this area serves as winter and seasonal range for pronghorn, mule deer, and elk (Glas & Jourdonnais, 2013). Mule deer and pronghorn were observed on this site during the field visit. Numerous elk pellet groups were observed during a short hike through the area during the 2013 field visit.

Special Status Wildlife Species

The USFWS identified four Candidate wildlife species, the greater sage-grouse (*Centrocercus urophasianus*), Sprague's Pipit (*Anthus spragueii*), Arctic grayling (*Thymallus arcticus*), and North American wolverine (*Gulo gulo*) and two Threatened species, Canada lynx (*Lynx canadensis*) and grizzly bear (*Ursus arctos*), protected under the Federal Endangered Species Act which could be present on or near the two permit areas. There is no suitable habitat present in either permit area for Arctic grayling, Canada lynx, or North American wolverine. Grizzly bear may pass through the proposed RWHR Mine site or the Alder Gulch area, but neither site has habitat suitable for long-term use by this species. However, mine workers should be made aware of the potential presence of grizzly bear and take reasonable precautions such as maintaining a clean site to prevent attracting bears.

RWHR Permit Area and Alder Gulch Processing Plant

A database query for sensitive wildlife species was requested from the Montana Natural Heritage Program for the RWHR permit area (Township 6S, Range 4W, Section 25, with a one mile buffer) and the Alder Gulch processing plant (Township 6S, Range 4W, Section 10, with a one mile buffer (MTNHP, 2013). No sensitive wildlife species were found within the permit boundaries. However, two Montana Species of Concern in addition to the previously identified federally-listed species were identified as occurring in the vicinity of the project area, bobolink, and great blue heron. Great blue heron have been known to nest near the Alder Gulch processing plant, and the wet areas along the northern margin of the RWHR mine site may be potential habitat for bobolink (MTNHP, 2013a).

The area surrounding the RWHR permit area supports habitat for sage-grouse, especially along the lower reaches of the site. Sage-grouse occupy sagebrush habitat throughout Madison County in relatively low numbers. In 2010, the USFWS determined that sage-grouse listing on the endangered species list was warranted but precluded by other species with greater threats. A litigation settlement requires the USFWS to make a decision by September 2015.

Catherine Wightman, MFWP sagebrush, Wetland and Farm Bill coordinator, was contacted for the most recent data regarding sage-grouse core areas (Glas & Jourdonnais, 2013). Core areas, as defined by MFWP are the primary or most critical strongholds for sage-grouse in Montana. The RWHR Mine site is 10 miles from a core area that extends into west-central Madison County from Beaverhead County (Glas & Jourdonnais, 2013).

MFWP Dillon area wildlife biologist, Craig Fager, was also contacted about any known locations of sage-grouse leks in the project area. Fager checked the internal records of

sage-grouse leks within the Alder area and found two leks. These leks were the Water Gulch and Quaking Aspen leks both of which are over four miles from the project area and had not had a positive sage-grouse observation during the previous three surveys, between 1988 and 2003 (Glas & Jourdonnais, 2013).

The RWHR Mine site contains habitat characteristics used by the two listed bird species. The Sprague's Pipit is typically found in grassland habitats which occur within the project area. The RWHR Mine site is on the western boundary of the pipit's breeding range and the bird is unlikely to occur within the permit boundaries due to habitat condition and proximity to human activities.

3.17 Fisheries and Aquatic Resources

3.17.1 Overview and Study Area

The study area for fisheries and aquatic resources is limited to the nearby sections of Alder Gulch, which has been disturbed by placer mining over the last century, and the excavated ponds at the Alder Gulch processing plant. There is a small, intermittent drainage at the northern edge of the proposed RWHR Mine site permit boundary, but it does not have sustained flow for a long enough period to support a fishery.

3.17.2 Methods

The Montana Fisheries Information System (MFISH) was queried for Alder Gulch and materials presented in the Garnet USA operating permit were reviewed to determine the potential for fisheries habitat and populations for the two permit areas. Historic stream channel configuration was compared to current channel locations using the 1965 Madison County water resources survey (Montana State Engineers Office, 1954). The Total Maximum Daily Load (TMDL) completed for the Ruby River watershed was reviewed for information on Alder Gulch related to support of aquatic life (DEQ, 2006).

3.17.3 Results

Alder Gulch is classified as a Class B-1 stream based on the most recent TMDL review (DEQ, 2012a). Waters classified B-1, are suitable for drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply. Alder Gulch is classified as "not supporting" for aquatic life. A sediment TMDL has been completed for Alder Gulch related to this impairment (DEQ, 2006).

Fish populations in the existing Alder Gulch permitted area are restricted to ponds in depressions between tailings piles, and a short section of a spur of Alder Gulch that flows through the flat tailings area and into the ponds. This short section of stream is connected to the channel of Alder Gulch and a pond complex associated with the tailings area immediately south of State Route 287 outside the permitted area, and flows about 2,300 feet on the surface before flowing into the North Pond at the northwestern corner of the permit

area (Figures 1.1-2 and 2.4-1). Portions of the channel have been straightened and other portions appear relatively unmodified. It is difficult to determine if this short section has a perennial connection with Alder Gulch, and much of its water likely comes from subsurface flow. Alder Gulch is a small stream measuring approximately 18 miles with its headwaters near Garrison Mine on Mount Baldy (MFISH, 2013). The main channel of Alder Gulch flows south of State Route 287, becomes discontinuous as it passes through the tailings areas near Virginia City, Nevada City, and Alder, and joins the Ruby River north of Alder.

The stream section within the Alder Gulch permit area contains emergent and submerged aquatic vegetation that could provide cover for fish and production of aquatic insects. There were no continuous surface flow connections between the permitted area's surface water and the unmined portion of Alder Gulch downstream of the project area.

Ponds within the permitted tailings area vary in depth, and most have limited potential to provide suitable year-round habitat for game fish. Water levels within these ponds fluctuate throughout the year in response to seasonal changes in subsurface groundwater levels. During the summer months, the ponds typically develop dense floating mats of algae and duckweed. These mats settled to the bottom over winter, and through decomposition, utilized much of the dissolved oxygen in the water. This oxygen depletion limits the ability of many of the ponds to overwinter game fish populations. The ponds may support amphibians and other water-dependent wildlife and provide a perennial source of water for a variety of organisms.

Fish stocking data from the MFWP show that no stocking has occurred in Alder Gulch over the period of record (MFISH, 2013). Rainbow trout (*Oncorhynchus mykiss*) are thought to occur in Alder Gulch, but their distribution is listed as limited to reaches of the Gulch upstream of the mining activity. There have been no population surveys of fisheries in Alder Gulch (MFISH, 2013). Fish may move into Alder Gulch from the Ruby River, but it is unlikely that they would migrate into the short spur section within the permit boundary. Fish have been stocked in several ponds within the Alder Gulch permit area in the past; however, there is no record of stocking dates, specific locations, and numbers of fish. Typically, fish reared at the Ennis National Fish Hatchery were given to local residents to place in those tailings ponds open to public fishing (Garnet USA, 2013).

Field observations of ponds in the permitted area during 1990 and 1991 and interviews with private landowners identified existing ponds that supported game fish populations. Local residents reported that bullheads and suckers were the most common fish found in ponds within the permit area, although some of the adjacent larger ponds were reported to possibly contain rainbow and brown trout (*Salmo trutta*) exceeding 10 pounds. From discussions with local landowners, rainbow trout were considered to be uncommon and the presence of other trout species is suspected, but has not been verified (Garnet USA, 2013).

RWHR Permit Area

There are no streams or waterways present within the proposed RWHR Mine site capable of sustaining populations of fish or other aquatic organisms. There is one intermittent draw at

the northeastern corner of the permit boundary, but it is uphill from and outside of the area proposed for disturbance. Ephemeral drainages exist within the permit boundary (See Section 3.5), but none contain water for sufficient duration to support riparian vegetation or create aquatic habitat.

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Chapter 4: Alternatives Analysis

4.1 Introduction

Chapter 4 describes potential impacts to the existing environment that could occur due to the Proposed Action, the No Action Alternative, and Agency-Mitigated Alternative (i.e., the alternatives carried forward for detailed analysis). The No Action Alternative analyzes potential impacts stemming from activities currently approved under the exploration license and the existing operating permit. DEQ completed an environmental assessment prior to issuing Exploration License No. 00642 (DEQ, 2009). The Proposed Action analyzes potential impacts stemming from the additional disturbance and activities included in Garnet USA's operating permit amendment application. The Agency-Mitigated Alternative includes components that may alleviate impacts identified for the Proposed Action. The Agency-Mitigated Alternative includes the following components:

- Construction of a diagonal access road to facilitate haul trucks crossing State Route 287 and to direct truck traffic away from residential areas along Ruby Road.
- Extension of the visibility berm included in the Proposed Action farther to the south. The berm would remove the East Road intersection with Ruby Road, and the East Road would be retired as an access route to the processing plant.
- Additional groundwater and surface water monitoring at the Alder Gulch and RWHR sites to evaluate potential nitrogen compound presence from blasting materials.

All other aspects of the Proposed Action would be retained as part of the Agency-Mitigated Alternative. Each alternative is described in Chapter 2. Chapter 4 serves three purposes: 1) it provides an analysis and comparison of alternatives and their impacts; 2) it ensures that the DEQ has a clear understanding of the potential impacts, both positive and negative, of all alternatives under consideration; and 3) it provides the public with information to evaluate DEQ's alternatives, including the Proposed Action. Impacts are assessed for the same environmental components discussed in Chapter 3.

MEPA defines three levels of potential impacts: primary, secondary, and cumulative. In some instances, impacts can be minimized or avoided altogether by making changes to an alternative. These changes are called "mitigation." Mitigation may become part of the preferred alternative if the decision-makers decide the mitigation significantly reduces impacts and can reasonably be incorporated into the alternative. The three levels of impacts and potential mitigation are examined for each resource area as described below. Some impacts may persist even with mitigation; these are called "residual impacts" under MEPA and are discussed at the end of this chapter.

4.1.1 Primary Impacts

Primary impacts are defined by MEPA as those impacts that have a direct cause and effect relationship with a specific action, i.e., they occur at the same time and place as the action that causes the impact. One result of implementing the Proposed Action would be the

excavation of the pit at the proposed RWHR Mine site. As described in Chapter 2, there would be some additional surface disturbance associated with the Proposed Action. Although many of the activities that would occur under the Proposed Action would stem from existing approvals under the Exploration License, the duration and extent of some of these activities, such as the extent of excavation or the duration of mine operation would be expanded under the Proposed Action.

4.1.2 Secondary Impacts

Secondary impacts to the human environment are indirectly related to the agency action, i.e., they are induced by primary impact and occur at a later time or distance from the triggering action. For example, an acknowledged secondary impact of excavating the mine pit would be a change in the topography after reclamation is completed.

4.1.3 Cumulative Impacts

Cumulative impacts are the collective impacts on the human environment within the borders of Montana of the No Action Alternative, Proposed Action, or Agency-Mitigated Alternative when considered in conjunction with other past, present, and future actions related to the alternative under consideration by location or generic type (75-1-220(4), MCA). Cumulative impacts can result from individual actions that are minor, but, when combined over time with other actions, become significant. Related future actions may only be considered when these actions are under concurrent consideration by any agency through pre-impact statement studies, separate impact statement evaluations, or permit processing procedures (75-1-208(11), MCA). Cumulative impacts are assessed using resource-specific spatial boundaries and often attempt to characterize trends over a timescale appropriate to the alternatives under consideration. Cumulative impacts can only be assessed for resources that are likely to experience primary or secondary impacts due to an alternative under consideration.

4.1.4 Mitigation

Mitigation includes any and all actions that DEQ could require Garnet USA to take to reduce adverse impacts of the alternatives being reviewed, such as:

- a) avoiding an impact by not taking a certain action or parts of an action;
- b) minimizing impacts by limiting the degree or magnitude of an action and its implementation;
- c) rectifying an impact by repairing, rehabilitating, or restoring the impaired resource; or
- a) reducing or eliminating an impact over time by preservation and maintenance operations during the life of an action or the time period thereafter that an impact continues. MEPA Model Rules II(14)

To be considered, mitigations must functionally reduce impacts related to an alternative under consideration; therefore, studies, monitoring plans, and further consultation do not satisfy the requirements of mitigation under MEPA.

4.1.5 Residual Impacts

Residual impacts are those that cannot be avoided, even with mitigation. These are summarized for all resource areas at the end of this chapter.

4.2 Geology and Minerals

4.2.1 No Action Alternative

There would be minimal primary and secondary impacts to the geologic resources through implementation of the No Action Alternative at the Alder Gulch site. Garnet USA could reprocess the placer tailings in the permit area. This would replace the cobbles into a more gentle topography. During reclamation the cobbles would be covered with stockpiled soil or fine tailings recovered from process settling ponds.

All previously permitted surface disturbances for facilities that affect geology have already occurred at the processing plant. During reclamation most of the disturbances would be regraded and covered with fines or soil and revegetated. Some buildings and other disturbance areas would be left for industrial use after mining. Mining at the Red Wash Alluvial site was permitted and reclamation has been completed under the No Action Alternative.

At the RWHR Mine site, Garnet USA could remove up to 10,000 tons of ore as a bulk sample under the exploration license as part of the No Action Alternative. This would provide a project life of less than one year. The geology within the mined area would be permanently altered. This impact has been evaluated and approved in a prior EA (DEQ, 2009).

4.2.2 Proposed Action

Under the Proposed Action, the primary impact to the geologic resources would be the removal of approximately 500,000 tons of garnet-bearing material per year from 54.4 acres of the pit over a 37 year-period from the RWHR Mine site. At present calculations, the mine is projected to produce 50,000 tons per year of finished garnet product. The geology within the mined area would be permanently altered with the removal of garnet-bearing bedrock for garnet-processing. The extent of mine excavation would exist for the life of the mine under the Proposed Action.

The pit highwalls that remain after reclamation is completed would be structurally competent. The rock faces in the pit consist of layered metamorphic rock including garnet gneiss, amphibole gneiss, and quartzo-feldspathic gneiss.

There is very low potential for secondary impacts from acid rock drainage and metal mobility from exposed geologic material. The result of Garnet USA's geochemical testing suggests that there is a low risk for acid generation by the rocks that would be mined (Garnet USA, 2013a). Sulfides were not identified in laboratory analysis of any whole rock samples. Asbestiform mineral fibers were not reported in any of the geologic samples analyzed.

There is the potential for increased metal mobility offsite due to blasting and crushing of the ore followed by wind or water erosion affecting waste rock and garnet-bearing stockpiles. The potential impact would be from blowing dust off the ore while being hauled to the plant and from wind erosion off stockpiles at the plant site. The impacts would be minimal as long as Garnet USA implements best available control technology (BACT) to control dust during operations. Wind and water erosion at the mine site would have minimal effects as long as Garnet USA implements its BACT program.

4.2.3 Agency-Mitigated Alternative

There would be minimal additional primary, secondary, or cumulative impacts to the geology under the Agency-Mitigated Alternative. The Agency-Mitigated Alternative would minimally alter the geologic resources at the Alder Gulch site by building a diagonal road and a visibility berm extension. The mining plan at the RWHR Mine site would not be modified by the Agency-Mitigated Alternative.

4.3 Soil Resources

4.3.1 No Action Alternative

There would be no primary or secondary impacts to soil resources through implementation of the No Action Alternative including reprocessing the dredge tailings at the processing plant in the future. All previously permitted surface disturbances that would affect undisturbed soil resources have already occurred. There would be some beneficial impacts during reclamation as most of the current disturbances would be reclaimed by regrading and covering with fines recovered from the processing ponds. This would speed soil redevelopment in the area by hundreds of years.

The reclamation plan would reclaim any disturbed areas resulting from the exploration activities at the RWHR Mine site with stockpiled soils. Reclamation would speed redevelopment of soil resources in the disturbed areas.

4.3.2 Proposed Action

The primary impact to soil resources under the Proposed Action would be disturbance and removal of soils at the proposed RWHR Mine site. In the first five years the estimated volume of Shurley-Rentsac soil to be disturbed is about 46.7 thousand cubic yards. The estimated volume of Kalsted Sandy Loam soil to be disturbed is about 478 thousand cubic yards. This is more than half of the total expected volume of soils for the life of the mine in the first five years, but the operations could ultimately lead to going deeper in some places rather than going wider in the excavation which would disturb substantially less area, and thus less soil, than anticipated in some of the earlier years.

The soils would be separated into two discreet piles. Soils coming off slopes of less than eight percent would be stockpiled in one pile. Soils coming off steeper slopes would be stockpiled separately. Soil salvaged and stockpiled would lose the hundreds of years of profile development that has occurred on the site. Stockpiling would destroy soil structure,

reduce soil biological activity, increase compaction and bulk density, and decrease the soil organic matter content. These are unavoidable impacts of permitting disturbance of the site for mining.

The soil stockpiles would be marked in the field and the slopes would be graded at a 3:1 horizontal to vertical slope and revegetated to limit erosion. Soil stockpile locations are shown on Figure 2.5.1. Silt fences, straw wattles, and other applicable BMPs would be implemented where appropriate to limit erosion and minimize sediment leaving disturbed sites including access and haul roads before and during construction. Some soil would be irrevocably lost during soil removal, construction, and operation of the mine. Additional soil would be lost during soil replacement prior to the reestablishment of vegetation. Secondary impacts to soil resources could result from increased wind and water erosion until the disturbed soil placed in stockpiles is revegetated.

During reclamation, stockpiled soils would be replaced. The soil from slopes less than eight percent slopes would be placed on slopes less than eight percent, such as the pit floor. Soil from slopes greater than eight percent would be replaced on slopes over eight percent such as the waste rock stockpile slopes. Stockpiling and replacement of the upper horizons of soil after mining would speed up soil redevelopment. Soil would be ripped to relieve compaction from equipment traffic. It would take decades for soil horizons to redevelop. The arid nature of the climate would contribute to a slow recovery of the soil structure. Soil organic matter contents would take decades to redevelop. Seeding the reclaimed areas would speed revegetation of the site. Typically it takes up to five years for native species on reclaimed areas to develop and limit soil erosion. The loss of soil, soil development, and the time needed for redevelopment of soils in an area is an unavoidable impact of disturbance.

With the Proposed Action, there would be larger amounts of exposed soil that could erode until successful revegetation occurs. Revegetation is dependent upon precipitation received after seeding and success of weed control. Garnet USA would be required to ensure the successful revegetation and weed control as part of the operating permit application reclamation plan.

4.3.3 Agency-Mitigated Alternative

There would be approximately 0.54 acres of additional soil disturbance on leveled naturally revegetated placer tailings resulting from the construction of a new haul truck access road that runs diagonally between the plant shop and office, and Ruby Road near the intersection with the State Route 287 (Figure 2.6.1). These young soils would be salvaged and stockpiled. The visibility berm on the east side of the permit area would be extended south across the East Road redisturbing some dredge tailings and covering them with soil or settling pond fines. There would be minimal additional primary, secondary, or cumulative impacts to the soil resources under the Agency-Mitigated Alternative.

The East Road plant access entrance located off of Ruby Road (across from the residences) would be eliminated and reclaimed. Access to the employee parking and the nearby silt ponds would be from the South Road through the office area and across the

current bridge. The East Road entrance removal and the extended visibility berm would be revegetated and maintained consistent with the current Alder Gulch operating permit. The Agency-Mitigated Alternative would not alter the soil resources at the Alder Gulch or the RWHR Mine site beyond the impacts described under the Proposed Action.

4.4 Vegetation and Wetland Resources

4.4.1 No Action Alternative

There would be primary or secondary impacts to vegetation resources (vegetation communities, noxious weeds) through implementation of the No Action Alternative including reprocessing the dredge tailings at the processing plant in the future. If the area is mined, partially revegetated dredge piles would be leveled and existing ponds between the dredge piles would be filled in. The mining and reclamation would enhance development of vegetation communities after mining and create more productive vegetation for the post-mine land uses.

There would be no acres of additional disturbance in the processing plant area under the No Action Alternative. There would be some beneficial impacts during reclamation as most of the facility disturbances would be reclaimed by regrading and covering with fines recovered from the processing ponds. This would promote revegetation and increase productivity over the dredge tailings.

All previously permitted surface disturbances that affect vegetation resources have already occurred at the RWHR Mine site. The reclamation plan would resoil and revegetate the disturbed areas at the RWHR Mine site disturbed under the exploration license.

Noxious weeds would increase on all disturbed areas over the life of the operation. Weed control would limit the expansion. The diversity of vegetation in the reclaimed communities would be less than the natural revegetated communities in the area because of noxious weed and other aggressive invasive species like cheatgrass and indirect impacts of noxious weed control programs that inadvertently or directly kill native species. The reduction in diversity in reclaimed communities and an increase in invasive species is an unavoidable impact of permitting disturbance for mining.

4.4.2 Proposed Action

The potential for impacts to vegetation resources at the Alder Gulch processing site would be similar under the Proposed Action as under the No Action Alternative. There would be approximately nine acres of additional disturbance for new ponds, the visibility berm, boneyard relocation, and employee parking areas under the Proposed Action (Table 2.4-1). These disturbances would largely occur on disturbed tailings minimizing additional impacts to vegetation resources. This section will focus on the potential impacts at the RWHR Mine site due to the Proposed Action.

Primary Impacts

Primary impacts due to the Proposed Action would include removal of diverse native vegetation communities and potential spread of invasive species carried to the site by trucks or spread by wind over the 37-year mine life. The 213 acres of disturbance would provide conditions for opportunistic weeds to grow until revegetation is successful. In addition, revegetation could struggle if periods of extended dry weather occur following seeding. Weeds, such as black henbane, cheatgrass, and mullein, and noxious weeds would establish during mine life and be a part of reclaimed communities.

Noxious weeds would increase on all disturbed areas over the life of the operation. Weed control would limit the expansion. The diversity of vegetation in the reclaimed communities would be less than the native communities in the area because of noxious weed and other aggressive invasive species and indirect impacts of noxious weed control programs that inadvertently or directly kill native species. The lack of diversity in reclaimed communities and increase in invasive species is an unavoidable impact of permitting disturbance for mining.

Secondary Impacts

Secondary impacts would include the spread of weeds to adjacent lands. Garnet USA has developed a weed control plan in cooperation with the Madison County Weed Board to minimize the potential for weed spread. If soil stockpiles are aggressively revegetated, then the potential for weed establishment and seed dispersal would be minimized. Garnet USA would also reduce the potential for secondary impacts to vegetation by concurrently reclaiming disturbed areas as they are no longer needed for mine operations.

The reclamation plan developed by Garnet USA has shown success at the nearby Red Wash Alluvial site which supports some vegetation species similar to that occurring at the RWHR Mine site. Vegetation canopy cover and productivity can be restored within three to five years on reclaimed sites. It is likely that reclamation at the RWHR Mine site would function as proposed, and that once reclamation is completed there would be negligible changes to the vegetation community in the area in terms of productivity and canopy cover. Plant communities at the Alder Gulch processing plant and at the Red Wash Alluvial site contain limited number of species compared to undisturbed plant communities in the area. The Proposed Action would have cumulative impacts on vegetation communities at the RWHR Mine site because of the reduced diversity of species. This is an unavoidable consequence of disturbing the site.

4.4.3 Agency-Mitigated Alternative

In general, the primary, secondary, and cumulative impacts to the vegetation and wetlands under the Agency-Mitigated Alternative would be the same as those described under the No Action Alternative and Proposed Action at the Alder Gulch processing area. The construction of the diagonal access road and extended visibility berm under the Agency-Mitigated Alternative would create minimal additional potential impacts.

The Agency-Mitigated Alternative does not include any changes to the Proposed Action at the Red Wash Hard Rock Mine site.

Primary Impacts

The Agency-Mitigated Alternative would require approximately 0.54 acres of additional surface disturbance in a naturally revegetated treed area on level tailings along the small stream that crosses the Alder Gulch permit area (Figure 2.6-1). This proposed haul truck access road would cross mixed riparian, wetland, and upland vegetation. The surface disturbance and potential for tree and other naturally revegetated plant community removal would constitute primary impacts to vegetation. The extension of the visibility berm that runs along Ruby Road would cross and block the current East Road entrance to the plant. The removal of the East Road entrance road and the extension of the berm would have a small impact on local vegetation. The area would be revegetated per the current operating permit for the Alder Gulch Mine site.

Secondary Impacts

Secondary impacts from the new access road would include possible changes to vegetation bordering areas of disturbance due to tree removal and changes in sun exposure. Weed establishment would increase. BMPs to prevent weed spread would include those included in the Weed Management Plan developed by Garnet USA. The stream that bisects the area of disturbance provides an additional vector for weed seed spread, and erosion-control measures such as straw wattles or fabric barriers would be used to minimize sediment input to the stream.

Under the Agency-Mitigated Alternative, the proposed Alder Gulch diagonal access haul route would bisect an area that contains wetlands, and some of the wetlands would be filled in (Figure 2.6.1). Filling in a wetland would constitute a primary impact and would also have the potential to cause secondary impacts to the wetlands nearby or the vegetation supported by the wetland hydrology. The design and alignment of the proposed roadway indicates that the potential acreage of fill would be 0.06 acres (Figure 2.6.1). Garnet USA would consult with the USACE to determine if the wetland impacts would require mitigation under Section 404 of the Clean Water Act before the road could be constructed.

Cumulative Impacts

Although the Agency-Mitigated Alternative would add to the overall surface disturbance, the amount of new disturbance would not be enough to constitute a cumulative impact to vegetation or wetlands in the context of other land uses in the area within and surrounding the Alder Gulch processing plant.

There would be no additional primary, secondary, or cumulative impacts to vegetation resources due to the Agency-Mitigated Alternative at the RWHR Mine site.

4.5 Surface Water Resources

4.5.1 No Action Alternative

There would be primary or secondary impacts to surface water through implementation of the No Action Alternative if Garnet USA began reprocessing the dredge tailings at the processing plant in the future. If the area is mined, dredge piles would be leveled and existing ponds between the dredge piles would be filled in. The Alder Gulch stream channel could be recreated as permitted. The mining and reclamation would remove the existing dredge ponds in the area that would be mined. In the reclaimed topography, an extension of the Alder Gulch stream channel could be constructed.

There would be no additional disturbance in the processing plant area.

4.5.2 Proposed Action

Primary impacts to the surface water resources at the Alder Gulch site would differ from the No Action Alternative for the Alder Gulch processing plant site. Garnet USA proposes to continue to monitor surface water locations on a quarterly basis at the Alder Gulch site. Baseline monitoring showed low concentrations for nitrogen compounds and metals; thus there is low potential for secondary impacts such as wind erosion and surface water runoff to carry metals and nitrogen compounds, increasing concentrations directly into surface water resources or indirectly into groundwater and then to surface water resources down gradient.

Nitrogen compounds could originate from blasting at the RWHR site and be transported in garnet-bearing rock to the Alder Gulch site for processing. Recirculation and reuse of water during processing separation may allow for a concentration of nitrogen compounds in the water in the new lined ponds that could potentially be released to groundwater or surface water. A surface water and groundwater monitoring plan is in place to establish a baseline of water quality at the plant site. This plan includes future sampling as needed.

Primary impacts to surface water resources at the RWHR Mine site would include irreversible alterations to the ephemeral drainages. The middle drainage of the RWHR Mine site is an ephemeral channel that traverses east to west across the middle of the permit area and would be partially excavated within the permit boundary during mining operations. The “south drainage” is an ephemeral channel in the southwest quadrant of the proposed boundary that would be altered by site activities. Flow from the middle and south drainages would be diverted or allowed to flow naturally to sediment and storm water control structures (Garnet USA, 2013a). Post-closure, drainage patterns would be identified and incorporated into reclamation to approximate pre-mine drainage patterns where possible. The mine excavation floor would drain to a sump and post-closure the drainage would be structured to slope off the site without ponding. Erosion control features would be left in place.

The RWHR Mine site does not have any perennial surface water features within the footprint of the mine layout that would require monitoring during the life of the mine. Potential

secondary impacts include wind erosion and surface water runoff which could carry metals and nitrogen compounds offsite and increase concentrations in nearby surface water resources. There is little likelihood that nitrogen and metals would be carried to surface water.

4.5.3 Agency-Mitigated Alternative

In general, the primary, secondary, and cumulative impacts to surface water resources under the Agency-Mitigated Alternative would be the same as those described under the Proposed Action. The construction of the diagonal access road under the Agency-Mitigated Alternative would create additional potential impacts as described below.

A new road may be constructed that cuts diagonally northwest from Ruby Road to redirect truck traffic into and out of the plant. Potential primary impacts to the surface water resources from the ore haulage road would be minimal. Potential secondary impacts to surface water resources from the ore haulage road would be an increase in runoff and sediment into the surface water drainage. Runoff can increase the volume of water delivered to the stream channel, but any increase in flow would be minimal due to the level terrain.

Garnet USA would install BMPs along the stream channel to minimize road runoff from directly impacting the stream channel. The stream as it traverses the Alder Gulch site flows seasonally. When flowing, the stream appears at the southeast corner of the site as groundwater discharging into the channel from the shallow alluvium. The stream then crosses the plant site and drains back into the shallow alluvium and mine tailings, but never exits the site as surface flow.

Surface water quality would be monitored by Garnet USA concurrent with future plant operations. Surface water quality would be monitored by Garnet USA concurrent with future plant operations. A monitoring plan has been submitted with the operating permit. Additional surface water monitoring locations have been identified by Garnet USA and DEQ and a revised monitoring plan would be submitted to DEQ for approval. These locations are shown in Figure 2.6-2 and 2.6-3. Samples would be collected for initial baseline data and analyzed for selected metals, nutrients, and other lab and field parameters. A sampling schedule would be approved by DEQ.

4.6 Groundwater Resources

4.6.1 No Action Alternative

There would be minimal primary or secondary impacts to groundwater through implementation of the No Action Alternative including reprocessing the dredge tailings at the processing plant in the future. If the area is mined, dredge piles would be leveled and existing ponds between the dredge piles would be filled in. The Alder Gulch stream channel would be recreated as permitted. The mining and reclamation would potentially change the amount and type of groundwater interaction with surface water after mining for the post-mine land uses. The interaction with surface water would be reduced since the small expressions of water between dredge piles would be eliminated. This would reduce

groundwater loss through evaporation and reduce opportunities for groundwater contamination via surface water exposure. There would be no additional acres of disturbance in the processing plant area under the No Action Alternative.

No groundwater resources would be impacted at the RWHR Mine site under the exploration license.

4.6.2 Proposed Action

Most impacts to groundwater quality and quantity at the Alder Gulch processing plant would result from the construction and use of the process ponds as part of the Proposed Action. Two new processing ponds, the north and south silt ponds, would be constructed with geosynthetic liners in the northwest corner of the Alder Gulch Site. The ponds would be lined and completed entirely above the water table. Garnet USA may construct a wet plant process pond directly to the east of the proposed silt ponds. The proposed east garnet storage pond would be reserved for material storage and would be unlined. The south garnet storage ponds 1 and 2 are proposed in the southeastern portion of the Alder Gulch site and would be used for material storage (Figure 2.4-1).

There would be no primary impacts to the groundwater from the newly constructed ponds. The ponds, as designed, would not intersect the water table. The lined ponds would have secondary impacts to the groundwater if a leak occurred in a liner. A leak has the potential to allow recycled process water with nitrogen compounds to reach groundwater. The unlined ponds would be used for material storage and have no primary effect on the groundwater unless some residual nitrogen compounds are contained in the silts. Secondary effects could be similar to the lined pond, where water from the material storage could move downward into groundwater, although the material stored in this area would be generally dry.

The RWHR Mine site would be expected to be mined as a dry operation and would not likely encounter measurable groundwater through the 37-year life of the life of the mine. All storm water from the mine site would report to storm water collection ponds to prevent discharge of storm water off site. The storm water would infiltrate into the soils and report to groundwater. The water could contain nitrogen compounds, metals in sediment from the mineralized zone, and petroleum products from mine equipment leaks. No monitoring is proposed for the storm water ponds.

The low levels of primary and secondary impacts to groundwater identified suggest that there would be no cumulative impacts to groundwater resources under the Proposed Action.

4.6.3 Agency-Mitigated Alternative

The Agency-Mitigated Alternative does not contain components that have the potential to substantially change impacts to groundwater from those anticipated under the Proposed Action. There would be limited primary, secondary, or cumulative impacts to groundwater under the Agency-Mitigated Alternative. The Agency-Mitigated Alternative would not alter groundwater resources at the Alder Gulch or the RWHR Mine sites. A limited monitoring

plan for the Alder Gulch mine site was submitted with the HROP. Additional groundwater monitoring locations have been identified by Garnet USA and DEQ, and a revised monitoring plan would be submitted to DEQ for approval. These locations are shown in Figure 2.6-2 and 2.6-3. Samples would be collected for initial baseline data and analyzed for selected metals, nutrients, and other lab and field parameters. A sampling schedule would be established by DEQ.

In order to mitigate the potential for nitrogen or other compounds to impact groundwater, groundwater monitoring would be conducted to better characterize current and ongoing future groundwater quality at the RWHR Site and the Alder Gulch processing facilities. If water quality in the Alder Gulch Mine site percolation ponds or groundwater monitoring wells at either the Alder Gulch or RWHR Mine sites approach DEQ 7 trigger value standards for metals, petroleum products, or nitrogen compounds, Garnet USA would have to address this impact. Garnet USA would establish a mechanism for responding to exceedances in the revised monitoring plan that would be submitted to DEQ for approval prior to mining.

4.7 Hazardous Materials

4.7.1 No Action Alternative

Primary Impacts

Materials which may be hazardous are currently present on the Alder Gulch site and include motor oil/lubricants, diesel fuel, gasoline, and septic waste. Fuel storage facilities are constructed of non-permeable, leak proof concrete containment of at least twice the total storage capacity. The bulk lubricant storage facilities at the shop site have a concrete, leak proof containment of double the storage capacity which functions in conjunction with the waste oil containment facility associated with the shop operation.

Each material if released could be potentially hazardous and might impact soils, surface water, and groundwater in the immediate area. Garnet USA would work in conjunction with the DEQ Water Protection Bureau to determine if a SWPPP is necessary for the processing facility.

The RWHR Mine site would not need a SWPPP for the limited exploration disturbance at the site. Storm water can easily be contained on site with BMPs. Based on this, the primary impacts of the No Action Alternative would be minor.

Septic effluent may also exhibit hazardous characteristics and is disposed through a septic system permitted by Madison County at the Alder Gulch plant site. Permitting assures that the septic design has met county requirements for the disposal of septic wastes. Based on the county requirements and permit approval, primary impacts from the septic system from the No Action Alternative would be minor.

Portable toilets would be used at the RWHR Mine site during the exploration phase.

Secondary Impacts

Deposition of pollutants on water, soil, vegetation, and impacts to unique, endangered, fragile, or limited environmental resources, terrestrial and aquatic life are expected to be minor as a result of current activities at the Alder Gulch Plant site. There is a possibility that contaminants could leave the site and impact water quality downstream which may affect vegetation or aquatic life. The secondary impacts from the No Action Alternative on the physical and biological environment in the immediate Alder Gulch plant site and RWHR exploration area would be minor.

Cumulative Impacts

There are no other large sources of potentially hazardous materials in the area. The cumulative impacts from the No Action Alternative on the physical and biological environment in the immediate area appear to be minor.

4.7.2 Proposed Action

Primary Impacts

The Proposed Action may result in a slight increase in materials on the processing site due to the increased site activity and duration of that activity. These materials may potentially be hazardous and include motor oil/lubricants, diesel fuel, gasoline, and septic waste.

Each material, if released, could be potentially hazardous and may impact soils, surface water, and groundwater in the immediate area. Garnet USA would work in conjunction with the Water Protection Bureau to determine if a SWPPP and Storm Water Discharge permit are necessary for both the Alder Gulch processing facility and the RWHR Mine site. No storm water would be allowed to leave the site. Garnet USA understands that runoff from storms cannot be allowed to leave the property without a SWPPP. The containment facilities would be designed and maintained to contain at least the 10-year, 24-hour storm event. Based on this, the primary impacts from the Proposed Action would be minor.

There may be a slight increase in septic effluent due to an increase in employees at the site. This waste would be handled by a septic system permitted through the Madison County Sanitarian. Septic systems are designed with potential demand requirements and are required to have approval from the county. The mine site has a septic system that was approved by the Madison County Sanitarian as part of the initial operating permit. Permitting assures that the septic design has met county requirements for the disposal of septic wastes. Based on the county requirements and permit approval, primary impacts from the septic system from the Proposed Action would be minor.

Sewage at the RWHR site shall initially be handled by the use of portable toilets which will be leased and serviced by an independent licensed contractor. Sewage shall be removed and disposed by the contractor in a manner consistent with state and federal regulations (Garnet USA, 2013a).

If a temporary office trailer or a lunch room is brought on-site, domestic wastewater and sewage shall be disposed in an on-site septic holding tank for periodic pump-outs. All

domestic water and septic systems shall be designed in compliance with Madison County and State of Montana sanitary regulations. A sanitary disposal permit shall be obtained from Madison County's Sanitarian and the disposal facilities inspected prior to use (Garnet 2013a). Based on the county requirements and permit approval, primary impacts from the septic system from the Proposed Action would be minor.

Secondary Impacts

Deposition of pollutants on water, soil, vegetation, and impacts to unique, endangered, fragile, or limited environmental resources, terrestrial and aquatic life would be minor as a result of proposed activities at the Alder Gulch plant site and the RWHR Mine site. There is a possibility of impacts to water quality from nitrogen compounds downstream which may affect vegetation or aquatic life. The secondary impacts from the Proposed Action on the physical and biological environment in the immediate area would be minor.

Cumulative Impacts

There are no other significant sources of potentially hazardous materials in the area. The cumulative impacts from the Proposed Action on the physical and biological environment in the immediate area would be minor.

4.7.3 Agency-Mitigated Alternative

The Agency-Mitigated Alternative does not contain components that have the potential to substantially change impacts due to hazardous materials from those anticipated under the Proposed Action. Under the Agency-Mitigated Alternative an access road would be constructed across naturally revegetated tailings in the vicinity of a tributary channel to the Alder Gulch stream channel. Garnet USA would need to secure appropriate permits or permissions from the USACE and develop a SWPPP for the road construction.

4.8 Air Quality

The Air Quality Management Bureau reviews permit applications and prescribes Best Available Control Technology (BACT) to address potential impacts as part of the permits they issue. There are two air quality permits that cover activities under the alternatives being considered, MAQP # 2888-03 covers activities and equipment present at the Alder Gulch processing plant, and MAQP # 4842-00 was issued for the crusher and supporting equipment including the generator as a mobile permit (Merkel, pers. comm., 2013).

Air quality permit, MAQP #4842-00, covers equipment needed for the No Action Alternative as well as for the Proposed Action. This air quality permit covers the diesel engine associated with the on-site generator. All mobile equipment such as passenger vehicles, mobile construction equipment (e.g. loaders), and haul trucks with engine emissions are covered under multiple tiers of emission standards adopted by a comprehensive national program through the engine manufacturers (EPA, 2013c).

4.8.1 No Action Alternative

Under the No Action Alternative, the Alder Gulch processing plant is expected to continue operation under its existing mine permit. It would process a 10,000 ton exploration bulk sample from the RWHR site and could process garnet materials from other alternate offsite locations if DEQ approves the offsite materials. The truck and other vehicle traffic involved with refurbishing the plant site or bringing garnet ore to the site may be a source of ongoing dust. The RWHR Mine site exploration disturbances would be limited.

Primary Impacts

The air quality permit MAQP #4842-00 contains an air quality analysis of the Garnet USA processing plant site and RWHR exploration disturbances. The analysis determined that the air quality impacts from the project would likely be minor because the facility would not be enlarged and operate on an intermittent and temporary basis. This would cover emissions from plant operations and dust from haul truck traffic. The impacts from the current permitting action are not expected to cause or contribute to a violation of any National Ambient Air Quality Standard (NAAQS) or Montana Ambient Air Quality Standard (MAAQS) or opacity requirements and would have minimal effect on the air quality of the project area.

This facility could be expected to operate in compliance with all applicable rules and regulations as outlined in the Montana Air Quality Permits (MAQP) #2888-003 and #4842-00 (DEQ, 2013a).

Pollutant deposition from the facility would be expected to be minimal because the pollutants are widely dispersed (from factors such as wind speed and wind direction) and exhibit minimal deposition on the surrounding areas. Therefore, air quality impacts in this area as a result of the No Action Alternative would be minor.

Secondary Impacts

Secondary impacts to the physical and biological aspects of the human environment as a result of the No Action Alternative would be minor if Garnet USA controls blowing dust from the operations area using the prescribed BACT as described in their air quality permits.

Deposition of pollutants on water, soil, vegetation, and impacts to unique, endangered, fragile, or limited environmental resources, terrestrial and aquatic life as a result of the No Action Alternative would be minor (DEQ, 2013a).

Cumulative Impacts

Cumulative impacts to the physical and biological aspects of the human environment as a result of the No Action Alternative appear to be minor.

There are no major sources of air pollutants within a 50 mile radius of the proposed project (Section 3.8.3). Cumulative impacts to physical and biological aspects on the physical and biological environment in the immediate area as a result of the No Action Alternative appear to be minor (DEQ, 2013a).

4.8.2 Proposed Action

Under the Proposed Action, the processing plant would continue operation under its current operating permit. Garnet USA would increase garnet production at the processing plant with ore from the RWHR site, possibly producing up to 50,000 tons of garnet per year (Garnet USA, 2013a). Most of the garnet ore would come from the RWHR Mine site, but other off-site sources of garnet ore are available and may be used if approved by DEQ. Garnet USA's operating permit amendment application estimates that higher grade ore from the RWHR Mine would generate approximately 30 truckloads per day, Monday through Friday, for 34 weeks each year.

Primary Impacts

Garnet USA would use prescribed BACT to control dust such as watering of haul roads. The most recent air quality permit (MAQP #4842-00) includes new equipment needed for the Proposed Action. Based on this, the air quality permit contains an air quality analysis of the proposed Garnet USA RWHR Mine Project. In the analysis, DEQ indicated that the air quality impacts from the current permit covering the proposed project would likely be minor. The impacts from the current permitting action, which would include the Proposed Action, are not expected to cause or contribute to a violation of any National Ambient Air Quality Standard (NAAQS) or Montana Ambient Air Quality Standard (MAAQS) or opacity requirements and would have minimal effect on the air quality of the project area (DEQ, 2013a).

This facility is expected to operate in compliance with all applicable rules and regulations as outlined in MAQP #2888-03 and #4842-00.

Pollutant deposition from the facility would be expected to be minimal because the pollutants are widely dispersed (from factors such as wind speed and wind direction) and exhibit minimal deposition on the surrounding areas. Air quality impacts in this area as a result of the Proposed Action would be minor if Garnet USA diligently follows its dust control program (DEQ, 2013a).

Secondary Impacts

Secondary impacts to the physical and biological aspects of the human environment as a result of the Proposed Action would be minor if dust is controlled using BACTs.

Deposition of pollutants on water, soil, vegetation, and impacts to unique, endangered, fragile, or limited environmental resources, terrestrial and aquatic life as a result of the Proposed Action would be minor (DEQ, 2013a).

Cumulative Impacts

Overall, any cumulative impacts to the physical and biological aspects of the human environment as a result of the Proposed Action would be minor.

There are no other major sources of air pollutants within a 50 mile radius of the proposed project (Section 3.8.3). Cumulative impacts to physical and biological aspects on the

physical and biological environment in the immediate area as a result of the Proposed Action would be minor (DEQ, 2013a).

4.8.3 Agency-Mitigated Alternative

No aspect of the Agency-Mitigated Alternative is likely to contribute to primary, secondary, or cumulative impacts to air quality.

4.8.4 Air Quality Permit Best Available Control Technology Requirements

The following are required control technologies outlined in the air quality permit for the each referenced emission type. They were selected by DEQ based on feasibility and cost.

A best available control technology (BACT) analysis was completed as part of air quality permit MAQP #4842-00. The analysis looks at control options for emissions based on technical and environmental feasibility, and economics of each option to select the option which would be considered the best available control technology.

Due to the limited amount of emissions produced by the diesel engines associated with the stationary generator, the lack of cost effective add-on controls, and the likelihood that the engines would be required to comply with federal engine emission limitations, compliance with applicable federal standards and operation and maintenance of the engines with no add-on controls would constitute BACT for these engines.

Water or chemical dust suppressant was determined by the DEQ to be BACT for fugitive emissions which would include Particulate Matter (PM) from activities outlined in the current permit to include haul road traffic, increases in aggregate throughput, and additional crushing and screening.

The current air quality permit includes conditions and limitations to ensure the facility will operate in compliance with all rules and regulations. MAQP #4842-00 includes conditions limiting the facility's opacity and requiring water and spray bars to be available on the site to ensure compliance with opacity standards. These conditions would limit fugitive emissions. Further, Garnet USA is required to meet federally-enforceable air quality limits to remain a minor source of emissions with respect to Title V permitting.

4.9 Power Supply

4.9.1 No Action Alternative

There would be no primary, secondary, or cumulative impacts to the power supply under the No Action Alternative. The power usage is unlikely to change substantially given that the equipment currently in use would remain in use under this alternative. Nor would the cumulative impact of this usage contribute to overall power usage in the Alder area. The RWHR Mine would not be constructed and disturbances would be limited to exploration work.

4.9.2 Proposed Action

There would be no primary, secondary, or cumulative impacts to the power supply under the Proposed Action. Power demand at the Alder Gulch processing plant is unlikely to change substantially given that the equipment currently in use would remain in use under this alternative. Although the production would increase, it is unlikely that this increase would cause the overall power demand on the system to exceed its current capacity. Nor would the cumulative impact of this usage contribute to overall power usage in the Alder area. Power at the RWHR Mine site would be provided by generators. There would be no additional demands on the power supply.

4.9.3 Agency-Mitigated Alternative

There would be no primary, secondary, or cumulative impacts to the power supply under the Agency-Mitigated Alternative. The Agency-Mitigated Alternative would not alter power usage at the Alder Gulch or the RWHR Mine site.

4.10 Noise

4.10.1 No Action Alternative

Garnet USA is currently approved for operating the Alder Gulch processing plant 24 hours per day.

If dredging doesn't continue at the plant site, the noise levels of the processing equipment and haul truck activities for the No Action Alternative would be the same as the levels while Ruby Valley Garnet was mining the Red Wash Alluvial site. These levels would be the same as described in Section 3.10. The only primary or secondary noise impacts for the No Action Alternative would result from operation of the processing equipment while the bulk sample was processed or if other ores, approved by DEQ, are hauled to the site for processing.

4.10.2 Proposed Action

Alder Gulch Site

Garnet USA will attempt to reduce the noise by limiting certain operations during evening and night hours (Garnet USA 2103). Hours worked in the plant, wet process, screening, drying, and bagging operations are dependent on sales and marketing efforts. In the past, the wet processing operations operated two shifts per day, five days per week between the hours of 6:00 a.m. and 2:00 a.m. (Garnet USA, 2013a). The screening and bagging operations would at times operate 24 hours per day, six days per week.

Noise associated with the previously approved Alder Gulch Mine Project primarily originated from the mining activities. Initially the mining operations were anticipated to involve one 10-hour shift daily between 7:00 a.m. and 7:00 p.m. with some overtime and weekend operation as necessary. Operations did not exceed 16 hours of operation in any given day. Operation of the mining activities typically did not occur during winter months.

Garnet USA has proposed that mobile equipment at the plant site used outdoors during daylight hours would be equipped with backup alarms and strobe lights (Garnet USA, 2013a). After daylight hours, only the MSHA approved strobe lights would be used, eliminating backup alarm noise. The only anticipated processing and mining equipment operating after 5:00 p.m. would be two front end loaders, two haul trucks, and one generator. Equipment would be inspected regularly and all noise preventing equipment would be maintained in good working order (i.e. mufflers, engine covers, generator sheds, etc.)

Garnet USA proposes to increase the production at the site over what was produced in the past. Although the Alder Gulch site is permitted to operate the processing plant for 24 hours per day, Garnet USA has indicated the plant's proposed hours of operation will initially be 7:00 a.m. to 5:00 p.m. every weekday (Garnet USA, 2013). If the processing plant equipment and operations at the Alder Gulch site of the Proposed Action are similar to the equipment and operations of the plant when it last operated in 2010, then the processing plant noise levels at nearby residences should be similar to what they were in 2010. If the plant operates continuously 24 hours per day, the noise levels are predicted to be L_{dn} 51 to 54 dBA, and if the plant operates between 7:00 a.m. and 5:00 p.m., the noise levels are predicted to be L_{dn} 43 to 46 dBA (Section 3.10.3). These levels are less than the EPA guideline of L_{dn} 55 dBA. If the plant operates between 7:00 a.m. and 5:00 p.m., the +3 to +6 increase compared to the L_{dn} 40 dBA ambient noise without the processing plant activities would be barely to clearly audible (Section 3.10.2). If the plant operates continuously for 24 hours per day, the +14 increase would be considered more than twice as loud than the L_{dn} 40 dBA ambient noise without the plant operating, which would be a significant noise impact at residences near the Alder Gulch site.

Although there has been diesel-powered equipment, such as loaders and dozers, working on the site since spring 2012, the noise they create is intermittent and varies as the equipment moves around the site, and these operations would continue in a similar manner (Garnet USA, 2013). The noise of the processing plant would be more of a constant, steady drone due to large process and ventilation fans which exhaust through the roof of buildings and the noise of operations inside the buildings.

Since the exhaust stacks of the plant are above the roof of the buildings, the existing visibility berm along Ruby Road does not block the line of sight between the stacks and the residences along Ruby Road, and the existing stockpiles do not block the line of sight between the plant buildings and the residences northeast of the site. Therefore, the berms and stockpiles would not mitigate the noise of the processing plant.

RWHR Site

The mine operating hours at the Red Wash Mine Site could reach 24 hours a day 7 days per week during the operating season. Garnet USA would stockpile ore and not operate the mine during the winter months. At the RWHR site, some operations and equipment would be similar to those during the recent exploration work, and some new operations and equipment would be used. The use of diesel-powered equipment and a rock drill would be

similar. Therefore, the noise levels of the diesel equipment and rock drill for the Proposed Action at the closest residence 1.2 miles west of the site would be similar to the noise levels during exploration. The estimated L_{dn} 41 to 43 dBA if the diesel equipment and rock drill operate continuously for all 10 hours between 7:00 a.m. and 5:00 p.m. on weekdays are less than the EPA guideline L_{dn} 55 dBA, and +1 to +3 dBA compared to the estimated L_{dn} 40 ambient noise levels. Although the diesel equipment and rock drill may be audible at the closest residence, noise impacts are not predicted for the diesel equipment and rock drill operations.

As mining progresses, the weight of explosive used per delay may change, but the necessary weight is unknown (Garnet USA, 2013). If blasting continues to use approximately 44 pounds per delay as used during exploration activities, the blast noise at the closest residence due to the Proposed Action would be similar. If the weight of explosive used during mining is increased to approximately 100 pounds per delay, the predicted blast noise is predicted to be L_{pk} 105 dBP, which is still less than the L_{pk} 115 dBP threshold for annoyance (USACHPPM, 2005). Although blasting noise would be audible at the closest residence, noise impacts would be minimal due to blasting.

A new crushing circuit would be added to the RWHR site. The noise level of a crushing circuit, which includes jaw and cone crushers, vibrating screens, and conveyor systems, is L_{eq} 66 dBA at 1,050 feet (BSA 2008). The crushing circuit noise level at the closest residence is predicted to be approximately L_{eq} 38 dBA, and L_{dn} 42 dBA if the circuit operates continuously for all 10 hours between 7:00 a.m. and 5:00 p.m. when the crusher is operating seasonally. The predicted L_{dn} 42 dBA is less than the EPA guideline L_{dn} 55 dBA (EPA 1979), and +2 dBA compared to the estimated L_{dn} 40 ambient noise levels. Although the crusher noise may be audible at the closest residence, noise impacts would be minimal for the crushing circuit.

If the same back-up alarms with the same settings currently in use at the Alder Gulch site and the RWHR site are used for the Proposed Action, then the back-up alarm noise would be similar to the existing environment (Section 3.10).

Haul truck traffic would increase for the Proposed Action to approximately 45 trips per day between 7:00 a.m. and 5:00 p.m. (Garnet USA, 2013). The haul truck traffic noise for the Proposed Action is predicted to be $L_{eq}(h)$ 45 to 47 dBA, which is less than the MDT $L_{eq}(h)$ 66 dBA traffic noise impact criterion, and +7 dBA compared to the $L_{eq}(h)$ 38 to 40 dBA haul truck noise during exploration (Section 3.11.3). The +7 dBA increase is less than the MDT +13 dBA increase noise impact criterion (MDT, 2011a). However, the +7 dBA increase would be perceived as between a clearly noticeable increase to being twice as loud as the existing haul truck noise, which may be a moderate noise impact for residences along Ruby Road (Egan, 1988).

For the Proposed Action, haul trucks would continue to enter the Alder Gulch site by using Ruby Road and the East Road, but a new West Road may be constructed so the haul trucks would follow a one-way loop path to Highway 287. Construction and use of the west road is

contingent upon approval by MDT. Use of the West Road would reduce the number of haul trucks passing by residences along Ruby Road by half. The predicted haul truck traffic noise at residences on Ruby Road for the Proposed Action is approximately $L_{eq}(h)$ 42 dBA, which is less than the MDT $L_{eq}(h)$ 66 dBA traffic noise impact criterion, and +4 dBA compared to the $L_{eq}(h)$ 38 dBA haul truck noise during exploration (Section 3.11.3). The +4 dBA increase is less than the MDT +13 dBA increase noise impact criterion (MDT, 2011a). The +4 dBA increase would be perceived as between a barely noticeable and clearly noticeable increase for residences along Ruby Road (Egan 1998). Although the increase in truck traffic noise may be noticeable, noise impacts would be minimal for the haul truck traffic along Ruby Road.

4.10.3 Agency-Mitigated Alternative

All aspects of the Agency Mitigated Alternative would be the same as the Proposed Action, except that the haul truck access to the Alder Gulch processing plant would be redirected from Ruby Road to a new diagonal road that would be constructed in the southeast corner of the Alder Gulch site (Figure 2.6-1). The new road would allow haul trucks to cross Highway 287 directly from Anderson Lane and access the site after briefly driving on Ruby Road to reach Garnet USA property. The new diagonal road would move the haul truck traffic farther from the Ruby Road residences and would reduce the truck noise at the residences. The proposed visibility berm that runs along Ruby Road would be extended southward preventing access on the East Road to the plant from Ruby Road near the residences. That berm would in effect cut off and eliminate the East Road entrance to the plant. The removal of traffic off of Ruby Road should help reduce the truck noise noted by the residents (Figure 2.6-1).

Noise associated with haul truck traffic to and from the processing plant was mentioned by residents living along Ruby Road. DEQ does not have the authority under the MMRA to require mitigation to reduce the noise levels. Garnet USA could implement the following measures to reduce noise impacts to the neighborhood around the processing plant:

- Limit the operation of outdoor equipment and operations at the Alder Gulch processing plant and the RWHR Mine site, to the proposed 7:00 to 5:00 p.m. on weekdays.
- Install high-grade mufflers on all diesel-powered equipment.
- Replace traditional “beep-beep-beep” back-up alarms on all mobile equipment at the Alder Gulch site and RWHR site with manually adjustable, self-adjusting, or broadband sound alarms. Any new equipment would have to be MSHA approved.

4.11 Cultural Resources

Alder Gulch Permit Area

A cultural resource survey and report was conducted in compliance with the provisions of the National Historic Preservation Act (Public Law 89-665 as amended), and Executive Order 1593 (Protection and Enhancement of the Cultural Environment) for land within the

proposed permit boundary at the Alder Gulch processing plant. As a result of the survey, mitigation by avoidance of identified historic resources has been included in the proposed project's Plan of Operations. The proposed project would be conducted entirely on privately owned lands. The processing plant has been permitted and no further action is required to protect cultural resources.

RWHR Mine Permit Area

In July of 2012 DEQ conducted a Class III field inspection of the proposed RWHR Mine site. No historic properties were found, nor was there any evidence of cultural properties within the area of potential effect (Sears, 2012). Therefore, it is unlikely that there would be any potential for primary, secondary, or cumulative impacts to cultural resources due to activities under any alternative under consideration. DEQ's operating permit cannot require Garnet USA to adhere to all state and federal regulations on private land if qualified prehistoric or historic articles are encountered during operations.

4.12 Socioeconomics

Socioeconomic impacts relate to the changes experienced by a community due to the alternatives under consideration. These can relate to changes in population, demographics, income, taxes, and demands on community and governmental services.

4.12.1 No Action Alternative

Garnet USA does not anticipate increasing its employees under the No Action Alternative. The number of people employed by Garnet USA to refurbish the plant and complete exploration and the current level of use of community and government services would remain the same. If the plant could find alternate sources of garnet ore or feedstock and get approval from DEQ to process at the Alder Gulch plant site, the plant could continue operation, but at an unknown level or duration. There would be minimal primary impacts to socioeconomic conditions anticipated due to the No Action Alternative. Individuals employed by Garnet USA are likely to remain in the community for the duration of their employment and then most of them would leave looking for alternate employment. Their use of governmental and social services would decrease unless they applied for unemployment. The overall cumulative effect of the No Action Alternative would be difficult to quantify. The current number of employees, 40-50, is not likely to be large enough to generate a measurable change to the socioeconomic statistics collected for Madison County (BLS, 2012). However, if the plant closes, the loss of this number of jobs in the Alder community could be significant.

4.12.2 Proposed Action

Primary Impacts

In general, the Proposed Action would provide beneficial economic impacts for the town of Alder and the 50-99 individuals employed directly and indirectly because of the project, and would not result in adverse social or economic impacts. Garnet USA anticipates employing 30 to 60 people directly, and generating from 50-99 total new employment opportunities in

Madison County (Cummins, 2013). However, the population demographic characteristics of Madison County or Alder are not likely to be significantly affected. Processing and marketing of garnet materials would result in an increase in both Alder community and county tax income. The garnet products from the proposed mine are expected to increase in value due to potential market niche shortfalls and increasing demand. Social and economic impacts associated with development of the proposed mine may include additional demands on governmental services, impacts on community and county facilities, and minor relocation or population increases.

The highest annual employment level in Madison County occurred in 2008 at 4,000 (BLS, 2012). The highest level of employment in Natural Resources and Mining was in the same year at 216, which was 5.4 percent of total employment. Table 3.12-3 details total employment in several major NAICS industries for Madison County from 2009 through 2010. Employment in Mining, Quarrying, and Oil and Gas (NAICS 21) over the past decade in Madison County was low in the early 2000s, experienced a high in 2008, and has since declined slightly, but has remained well above levels seen in 2002 (Cummins, 2013). Garnet USA's Plan of Operation would substantially increase the employment in the Mining, Quarrying, and Oil and Gas industry in Madison County. By increasing employment within this industry by 30 to 60 employees, Garnet USA's operations would also increase demand for other services in the county, such as truck driving to transport product, and creating more household income which would create induced demand for services in the county, such as groceries, health services, and retail goods. The potential increase in total employment would be the equivalent of 50 to 99 new full-time jobs per year in Madison County (Cummins, 2013).

Secondary Impacts

The relatively long-term aspect of the life of the mine as proposed would retain these jobs within the community for as long as 37 years. This consistent economic stimulus has the potential to have a long-term positive effect on socioeconomic conditions within Madison County. Jobs in the mining industry are likely to pay at a level higher than the current average per capita income in Madison County (Table 3.15).

Employment in mining, quarrying, and oil and gas in Madison County has decreased each year since 2008, and as of 2011 was below 50 (Cummins, 2013). An additional 30 to 60 jobs in this industry would create a total of 50 to 99 jobs in Madison County, when indirect and induced jobs are taken into consideration. The direct jobs added by Garnet USA would be higher paying than average and would produce more output than average. Although it was not an element of this study, the expansion of operations would also result in increased property and income taxes.

Cumulative Impacts

Cumulative impacts due to the Proposed Action on the socioeconomics of Madison County are likely to be localized and beneficial. The increase in available, higher paying jobs would contribute to economic growth in the area which may be reflected in economic statistics for

the county. The high rental vacancy rate in the county may allow potential Garnet USA employees to find housing without difficulty, and the fact that schools are currently below capacity should allow families to join the communities without stretching available services.

4.12.3 Agency-Mitigated Alternative

The proposed addition of a road segment may create some short-term jobs in construction, but it would not result in significant primary, secondary, or cumulative impacts to the socioeconomic conditions in Madison County beyond those identified for the Proposed Action.

4.13 Transportation

The main roadways with potential to be impacted by any alternative under consideration are Ruby Road and State Route 287. State Route 287 is maintained and regulated by MDT. DEQ does not have regulatory authority over the use of publicly maintained roads.

4.13.1 No Action Alternative

Primary Impacts

Under its exploration license, Garnet USA can remove a 10,000 ton ore bulk sample from the RWHR Mine site and transport it to the Alder Gulch processing plant. The hauling activities for the exploration work have typically involved four to eight truckloads per day to haul the 10,000 ton bulk sample down to the stockpiles at the processing plant (Garnet USA, 2013). The current operating permit for the Alder Gulch processing plant allows ongoing processing of garnet ore regardless of the source of that material if approved by DEQ. If the company is able to locate alternate sources of garnet feedstock for the plant, it could conceivably operate to process that ore. Truck traffic related to bringing garnet ore to the plant (from whatever direction) may affect other travelers on the private ranch roads, Ruby Road, Anderson Lane, or State Route 287. Haul trucks crossing State Route 287 from the south and entering the processing plant via Ruby Road and the East Road would create dust and produce noise that may affect local residents. These activities are permitted under the exploration license. Off-site ores would have to be approved by DEQ.

Secondary Impacts

It is unlikely that actions under the No Action Alternative would cause secondary impacts to transportation in the Alder area. The permitted level of truck traffic would continue during exploration. Garnet USA has performed some upgrades on the ranch roads and county sections of unpaved roads to accommodate the haul trucks.

Cumulative Impacts

The No Action Alternative would not contribute to cumulative impacts to transportation in the Alder area. There are no related future actions that have the potential to increase or change traffic or transportation corridors in or near Alder.

4.13.2 Proposed Action

Primary Impacts

Under the Proposed Action, Garnet USA would begin full scale mining at the RWHR mine and would increase the number of truck trips between the RWHR Mine site and the processing plant to 45 truck trips per operating day (Garnet USA, 2013). The anticipated startup schedule is to haul ore in up to 10 hour shifts five days per week from the mine site. Hauling would be managed between the hours of 7:00 a.m. to 5:00 p.m. The most likely times for the haul trucks to affect other traffic would be in the morning and evening commute hours, during school bus loading time, and seasonally in the summer when tourism increases traffic on State Route 287.

Primary impacts to transportation could include delays to traffic as the haul trucks cross State Route 287 to Ruby Road from Anderson Lane. There is a slight misalignment of these two roads as trucks cross from Anderson Lane onto Ruby Road. Other potential impacts due to haul truck and other traffic related to the Proposed Action would include increased noise, dust, and lights from truck traffic on Ruby Road in front of residences.

Secondary Impacts

Accidents due to increased truck traffic are another potential secondary impact of the Proposed Action. Higher traffic volume in the summer and visiting drivers less familiar with the truck presence may increase the likelihood of accidents occurring between haul trucks and passenger vehicles.

A western one-way haul truck route for the haul trucks to exit the plant is included in the Proposed Action. Trucks would enter State Route 287 west of the Alder Water and Sewer District facility, turn left (east) and drive toward Anderson Lane. They would then turn right (south) onto Anderson Lane. It is unlikely that Garnet USA's use of State Route 287 or other parts of the haul route between the RWHR Mine site and the processing plant would impact transportation beyond the extent of the haul route.

Cumulative Impacts

It is unlikely that Garnet USA's proposed use of State Route 287 would contribute to cumulative impacts to transportation in the Alder area. There are no related future actions that have the potential to increase or change traffic or transportation corridors in or near Alder.

4.13.3 Agency-Mitigated Alternative

Primary Impacts

As part of the Agency-Mitigated Alternative, Garnet USA would create a new access road to the site for ore haul trucks. This road would have the trucks turn north onto Ruby Road, then immediately deviate left onto an entrance road that would run diagonally northwest toward the office and processing plant facilities. Primary impacts from adoption of the Agency-Mitigated alternative would include the elimination of Garnet USA haul truck and employee

traffic on the majority of Ruby Road. By retiring the East Road entrance, Garnet USA would no longer use that portion of Ruby Road near the residences to access the processing plant.

Along with the removal of the East Road entrance, the visibility berm that is part of the Proposed Action would be extended south across the old East Road as far south as feasible. This southern extension of the visibility berm would prevent use of the East Road entrance and isolate the Ruby Road residences from truck and auto traffic related to the processing plant. Eliminating haul truck and employee traffic on Ruby Road would reduce noise, dust, and light experienced by residents, but most of all it would reduce the chance of collisions between the haul trucks and local traffic. The alignment of Ruby Road and Anderson Lane would contribute to safety at this intersection. The specifics of the angled access to the processing plant would be determined by consultation between landowners, Madison County, MDT, and Garnet USA. The angled access road would provide a shorter and more direct haul route to the processing plant. The partial realignment of Anderson Lane and Ruby Road may allow trucks to cross State Route 287 more efficiently. This could also reduce the overall likelihood of conflict with other traffic and increase traffic safety along the route.

The proposed West Road would need to be permitted by MDT. The new diagonal road would be designed for two way haul truck traffic.

Secondary Impacts

It is unlikely that Garnet USA's altered crossing of State Route 287 would impact transportation beyond the extent of the new processing plant entrance. If the angled entrance to the processing plant does increase crossing efficiency for the haul trucks, there could be fewer traffic delays due to slow moving trucks at the crossing site.

Cumulative Impacts

It is unlikely that Garnet USA's retiring use of the East Road and creating an alternate access road to the processing plant would contribute to cumulative impacts to transportation in the Alder area. There are no related future actions that have the potential to increase or change traffic or transportation corridors in or near Alder.

4.14 Land Use and Recreation

4.14.1 No Action Alternative

Land use at the Alder Gulch processing plant during operations is unlikely to change substantially given that the equipment and areas of the plant currently in use would remain in use under this alternative if mining resumed on the site. At closure, the site would be reclaimed and revegetated except for some of the buildings and parking areas which would be left for alternate industrial land uses.

The activity at the plant would not contribute to cumulative impacts to land use in the Alder area. The lands within the Alder Gulch permit area are private and not available for public recreational activities.

There would be limited primary impacts to the RWHR site from the ongoing exploration license activities. These would include some drilling, blasting, soil stockpiling, and reclamation activities. There would be no primary, secondary, or cumulative impacts to existing land use at the RWHR Mine site under the No Action Alternative. There is no grazing occurring at the RWHR site proper, but some still occurs on lands surrounding the exploration site. After the exploration is completed the site would be reclaimed and grazing would resume.

4.14.2 Proposed Action

Primary Impacts

The mining and processing facility land use at the Alder Gulch plant site would continue as permitted. Mining is not being proposed at the site at this time, but has been previously approved. The post-operations land use would be as described for the No Action Alternative.

Under the Proposed Action, land use in the RWHR permit area would be converted from exploration blasting, trenching, and ore removal to include full scale mining. The footprint of the proposed mine would cover approximately 213 acres of the 340 acre permit area over a 37-year mine life. The topography of the land would be changed as the garnet ore is removed and the area would become an industrial mining site. At closure, the disturbances would be reclaimed and the site would be restored to grazing use and wildlife habitat.

Secondary Impacts

There would be no secondary or cumulative impacts to land use under the Proposed Action. Land use in the areas surrounding the Alder Gulch processing plant and the RWHR Mine site is unlikely to change substantially given that the existing land uses are well established and consistent with the types of use proposed under this alternative. The areas surrounding, but outside the permit boundary of, the RWHR site could continue to be grazed or used by the landowner for agricultural purposes. Exploration work has identified a large garnet resource in the area on surrounding lands (Garnet USA, 2013a). Approval and operation of the mine may stimulate secondary exploration on neighboring properties around the mine area.

The conversion of the RWHR mine site from exploration activities to full scale mining is unlikely to contribute to cumulative impacts to land use in the Alder area. After reclamation, the RWHR Mine site would likely revert back to grazing use unless the mining is expanded. The lands within the two permit areas are private and not available for public recreational activities.

4.14.3 Agency-Mitigated Alternative

Under the Agency-Mitigated Alternative, a small section of land within the Alder Gulch permit area would be disturbed to create an access road. Since the land to be used is part of the processing plant, this change would not constitute a primary or secondary impact to overall

land use. Adding the access road would not contribute to cumulative impacts to land use in the Alder area.

The Agency-Mitigated Alternative does not contain any other components that have the potential to substantially change impacts to land use from those anticipated under the Proposed Action.

4.15 Visual Resources and Aesthetics

Impacts to visual resources and aesthetics can include changes to the character of a landscape or the visibility of a landmark or scenic view. The rural nature and open range characteristic of the area near Alder contributes to longer sight distances, which can make changes more obvious to the observer.

4.15.1 No Action Alternative

The continued use of the Alder Gulch processing plant would not alter the industrial character of the site or the facilities visible to the public unless Garnet USA decided to resume mining in the future at the site. In that case, there would be limited primary, secondary, and potentially cumulative impact to visual resources or aesthetics during operations due to the selection of this alternative. Mining of the site and subsequent reclamation of the dredge tailings could improve the overall aesthetics of the Alder Gulch processing plant.

4.15.2 Proposed Action

The visibility berm proposed along Ruby Road would help minimize the visibility of some of the operations at the plant site including lights, truck traffic, and dust. The East Road would remain in use creating light, traffic, and dust impacts to local residents along Ruby Road. The land use changes during operations and closure would be similar to those discussed under to No Action Alternative.

Garnet USA conducted a viewshed analysis to determine if the proposed surface disturbance at the RWHR Mine site would be visible from publicly accessible areas. The viewshed analysis selected five points based on initial spatial assessment of the most likely areas where the RWHR Mine site would be visible (Blocker, 2013). All five sites were on publicly accessible roads. Due to its remote location and being on private property, the RWHR Mine site has limited visibility to the public. Visibility of the site is limited from State Route 287 and the town of Alder due to the rolling hills, trees, and existing placer piles. The site is partially visible from some private residential and agricultural properties on Upper Ruby Road and Anderson Lane, but the viewshed analysis found locating the site from Anderson Lane to be challenging. The point where the proposed RWHR Mine site is most easily visible is near the Ruby Reservoir Road, but only one to three percent of the site is likely to be visible from this location (Blocker, 2013).

When the 100 acre mining and milling waste stockpile stockpile was added to the digital analysis, the RWHR Mine site became difficult to distinguish from the undisturbed hillsides

at all visibility assessment points (Blocker, 2013). The slopes of the mining and milling waste stockpile would be maintained at a final 3:1 horizontal to vertical slope during the mining activities and be concurrently reclaimed during mine life. This concurrently reclaimed slope minimizes the need for rework in reclamation activities and helps minimize the visual impact as it is similar in slope to the range behind it. The slopes of the soil stockpiles would be maintained at a 3:1 horizontal to vertical ratio and would be seeded to minimize visual contrast and with the surrounding terrain during operations.

Post-closure, Garnet USA would regrade the upper lifts of the mining and milling waste stockpile to an average 3:1 horizontal to vertical slope. The grade may be steepened in a natural regrade design, with agency review and approval, in some areas if materials testing indicate that steeper slopes can be incorporated without risk. Variable slopes would enhance visuals and reduce the manmade appearance of the facilities. The regraded waste rock stockpile would then be seeded with an approved seed mix.

Garnet USA also would grade, soil, and revegetate the pit floor, which comprises a majority of the pit. Garnet USA would also apply 30 inches of soil to flat safety benches in the pit highwall and seed with an approved seed mix. The reclamation would be done in a manner to smooth the transition between the steeper rock faces and flat benches to maximize the revegetated area. Revegetation of the pit floor and flat safety benches would reduce visual contrasts with adjacent lands. About 10 percent of the pit highwalls would be reclaimed in a different manner than the stable rock slope and bench method to further reduce the visual contrast with adjacent lands, provided work can be accomplished safely. About five percent of the upper northeast corner highwall and five percent in the southeast corner highwall would be partially backfilled to create 2:1 horizontal to vertical slopes, covered with rocky soils to reduce erosion, and seeded.

Due to the remote nature of the proposed RWHR Mine site and the topography of the local terrain, there would be negligible primary or secondary impacts to visual resources due to the Proposed Action. After mining and reclamation at the RWHR Mine site, the visual appearance would be enhanced by the revegetated grassland, and no secondary or cumulative impacts are anticipated.

4.15.3 Agency-Mitigated Alternative

The Agency-Mitigated Alternative would minimize visual impacts to the residents along Ruby Road by rerouting the access to the plant site along a diagonal road (Figure 2.6-1). In addition, the proposed visibility berm would be extended south to remove the East Road access to the plant site from Ruby Road. These two measures would reduce visual impacts of lights, truck traffic, and dust to the residents along Ruby Road. If Garnet USA develops an alternative entrance to its Alder Gulch processing plant, primary or secondary impacts to the overall character of the area are likely to be minimal. Given the industrial nature of the area along State Route 287 in the vicinity of the project, the new entrance would not contribute to cumulative impacts to the visual character of this stretch of highway.

The Agency-Mitigated Alternative does not contain any other components that have the potential to substantially change impacts to visual resources from those anticipated under the Proposed Action.

4.16 Wildlife Resources

4.16.1 No Action Alternative

The continued use of the Alder Gulch processing plant and the approved potential future mining of the site would not alter the industrial character of the site or the likelihood of wildlife occurrences therein. Garnet USA has mitigations included in its operating permit to accommodate nesting and migratory birds and prevent impacts to these protected species. In the past, all nests in a great blue heron rookery in the permit area were protected with a minimum of a 200 foot “no mine zone”. Currently no mining occurs within 500 feet of the nests or rookery during nesting season if the nests are found to be active. Activities and ongoing work at the processing plant would be conducted so that it does not harass nearby nesting birds at the facility.

Most species of birds, including eagles and other raptors, including owls, are protected under the Migratory Bird Treaty Act (16 U.S.C. 703). Bald eagles and golden eagles receive additional protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668).

If these bird species are present onsite, there would be minimal potential for primary, secondary, or cumulative impact to wildlife resources due to the selection of this alternative.

At closure, the majority of the site would be reclaimed and revegetated. Some of the buildings, roads, and parking areas would be left for alternate industrial land uses after mining and processing are completed.

Reclamation of the exploration disturbances at the RWHR site would limit the wildlife impacts created during exploration.

4.16.2 Proposed Action

Primary Impacts

The impacts to the Alder Gulch processing plant area would essentially be the same as the No Action Alternative although there would be up to 37 years of additional ore processing from the RWHR site.

Under the Proposed Action, land use in the RWHR permit area would be converted from exploration to mining. The change in land use has the potential to affect wildlife by destroying ground-nesting bird and small mammal habitat. Ungulates, birds, and mammals would be likely to avoid the area because of the increased human presence and noise from equipment at the site. Spring nesting surveys would be conducted each year prior to soil removal and stockpiling, as well as mining, to comply with the Migratory Bird Treaty Act of 1918. Per the proposed mine operating plan, any active nest would be protected from mining activities until the nest has been abandoned.

Although use of the RWHR Mine area by grizzly bears is unlikely, the bears have been expanding their distribution in the Gravelly Range (FWP, 2002). If bears are sighted or evidence of bears is detected by Garnet USA, consultation with the USFWS would be necessary. Garnet USA can provide information to workers and follow basic practices to avoid conflict with bears such as keeping the mine area clean of food and trash that may act as attractants (FWP, 2002).

While much of the pit at the RWHR is being reclaimed for grazing, the majority of the highwalls would be reclaimed to rock faces for wildlife habitat. In the upper pit rock faces, Garnet USA would excavate two cavities to produce wildlife habitat for bats or nesting areas for raptors. Garnet USA is also revegetating flat safety benches in the pit after application of 30 inches of soil. In addition, Garnet USA is partially backfilling approximately five percent of the upper northeast corner highwall and five percent of the southeast corner highwalls to create 2:1 horizontal to vertical slopes, then covering them with rocky soils and seeding with an approved seed mix. These areas would also provide wildlife habitat.

Secondary Impacts

The footprint of the proposed mine covers approximately 213 acres of the 340 acre permit area within a large undeveloped area between isolated mountain ranges. Although wildlife use of this area may be altered, this alteration is not likely to impact wildlife populations or the survival of individuals.

The areas surrounding the RWHR site could continue to be grazed or used by the landowner for agricultural purposes.

The conversion of the RWHR mine site from exploration trenching, blasting, removal of a bulk sample, and stockpiling of soils to full-scale mining is unlikely to contribute to cumulative impacts to wildlife in the Alder area. There are no other related future actions that have the potential to impact wildlife resources.

4.16.3 Agency-Mitigated Alternative

Under the Agency-Mitigated Alternative, a small section of land within the Alder Gulch permit area would be disturbed to create a diagonal access road. The land to be used consists of naturally revegetated tailings. This less than one acre change near State Route 287 would not constitute a primary or secondary impact to overall land use. Adding the access road would not contribute to cumulative impacts to wildlife in the Alder area. All other aspects of the Proposed Action related to wildlife resources including any mitigations in the operating permit amendment application would remain the same.

4.17 Fisheries and Aquatic Resources

Impacts to fisheries would be closely linked to potential impacts to groundwater and surface water as described in Sections 4.5 and 4.6, respectively. Both water quantity and water quality have the potential to affect fisheries, amphibians, and other aquatic organisms because of their dependence on the aquatic environment. Impacts previously described are

not repeated here except to explain how changes would potentially affect fisheries or aquatic resources.

4.17.1 No Action Alternative

Primary Impacts

Under the No Action Alternative, a 10,000 ton bulk sample from the RWHR site would be processed at the plant site. In addition, the plant can receive and process an unspecified amount of garnet ore from other off-site sources. Ore processing activities under the No Action Alternative may have the potential to affect the water levels in the ponds at the Alder Gulch processing plant. However, the ponds' seasonal fluctuations have been documented in the past, and the level of dewatering proposed should not result in noticeable changes in the character of the pond habitat. There are no records of fisheries populations using the spur of Alder Gulch contained within the Alder Gulch permit area, and its habitat value to the overall fishery of Alder Gulch is low. This coupled with the lack of a direct surface water connection to Alder Gulch or Alder Gulch Creek make the potential for any primary impacts to fisheries resources due to the No Action Alternative negligible. Alder Gulch Creek is seasonally dry in the reach as it traverses the Alder Gulch mine site and processing plant permit area.

The bulk sample processing would produce minimal impacts to water levels at the plant site or increased nitrogen compounds in surface or ground water from blasting residues. No nitrogen compound monitoring is included in the current water monitoring program at the Alder Gulch Mine site.

If Garnet USA dredges the rest of the approved permit area in the future, then ponds between tailings piles would be filled in removing any fish and aquatic resources in those areas. Upon closure, Alder Gulch Creek could be reestablished through the dredged area. This would reestablish some of the aquatic and fisheries habitat. Some processing ponds would remain on the site to replace the lost aquatic habitat.

Secondary Impacts

Garnet USA has developed a surface water and groundwater quality monitoring plan at the Alder Gulch processing plant site. Monitoring would allow detection of contaminants listed in the monitoring plan entering the ponds. In the absence of a liner, the ponds are connected to the groundwater in the Alder Gulch processing plant area. Secondary impacts could occur if contaminants from materials originating from the site pass through the unlined ponds and move down gradient via groundwater or enter surface water bodies.

There would be the potential for impacts from nitrogen compounds from the bulk sample getting into the ponds and regional groundwater. Nitrogen compounds would increase the potential for aquatic resource impacts due to reduction in oxygen in the water from excessive algal production and decomposition. However, the probability of this type of impact is low given the likely concentrations of nitrates, potential for uptake by existing vegetation, and the numbers of fish present in the unlined ponds (Allan, 2001).

Cumulative Impacts

The minimal primary or secondary impacts to aquatic habitats or fisheries suggest that there would be no cumulative impacts to these resources from the selection of the No Action Alternative.

4.17.2 Proposed Action

Under the Proposed Action, processing activities would continue at the Alder Gulch site for up to 37 more years, production would increase, and process water would be recycled from two lined ponds. The impacts due to additional processing are not likely to substantially change the water level fluctuations in the ponds because of this water reuse.

Nitrogen compounds would be delivered to the processing plant area from the RWHR site as explosive residues in the ore. Runoff from the stockpile sites and wet processing the ore could wash nitrogen compounds into ponds and groundwater. The lined ponds would receive the bulk of the process water and nitrogen compounds. Nitrogen compounds would increase the potential for aquatic resource impacts from excess algal production and decomposition. However, no fish are present in the recycle ponds, and the levels of nitrate would be expected to be low enough to be taken up biologically without causing excess algal production. If algal blooms occur in the lined ponds, oxygenation would reduce the potential for negative impacts.

There are no perennial aquatic resources at the RWHR Mine site; therefore, there would be minimal potential for primary, secondary, or cumulative impacts to fisheries or aquatic resources from the activities under the Proposed Action. The small intermittent stream in the northeast corner of the permit area is removed from any proposed surface disturbance and uphill from the mine site. It is unlikely that this intermittent stream would be impacted by the Proposed Action. The storm water BMPs proposed should be sufficient to prevent any substantial runoff or sediment from leaving the mine site. Garnet USA has not proposed any groundwater monitoring at the RWHR site.

4.17.3 Agency-Mitigated Alternative

The Agency-Mitigated Alternative would develop a diagonal access road for the haul trucks at the Alder Gulch processing plant. Development of the access road would slightly alter the riparian vegetation along the tributary channel of Alder Gulch that crosses the permit area. The level of impact from the potential disturbance associated with building the road would be minimal. To further minimize impacts from this alternative, the road alignment would avoid the stream channel and if culverts are required, they would be sized to accommodate seasonal high flows. Standard sediment control BMPs would be used to prevent sediment and road materials from entering the stream channel during construction and use of the road.

The monitoring plan for the Alder Gulch processing plant and mine permit boundary and the RWHR site would be augmented to include sufficient groundwater and surface water quality monitoring to evaluate if there are any impacts of the mining or processing activities on

surface water or groundwater from nitrogen compounds. The increased monitoring is intended to ensure that these resources are not being impacted by mining activities (nitrogen compounds originating from explosives) used at the RWHR Mine site.

The Agency-Mitigated Alternative does not contain other components that have the potential to substantially change impacts to fisheries or aquatics from those anticipated under the Proposed Action.

4.18 Residual Impacts

Residual impacts include changes that either cannot be mitigated or persist even with mitigations. The residual impacts due to the No Action Alternative would include the changes in topography after removal of the 10,000 ton bulk sample at the RWHR Mine site under the exploration license. Regrading and other reclamation actions would minimize the impacts. Other residual impacts include the reduction in diversity in reclaimed vegetation communities, loss of native vegetation, and an increase in invasive species, all unavoidable impacts of permitting disturbance for mining.

The character of residual impacts under the Proposed Action would be similar to that under the No Action Alternative, but the extent and duration of the impacts would be larger because the amount of material removed would be approximately 500,000 tons of garnet-bearing material per year over a 37-year period from the RWHR Mine site, which would leave a pit. Stockpiling soils would destroy soil structure, reduce soil biological activity, increase compaction and bulk density, and decrease the soil organic matter content.

These changes to the landscape are related to the purpose of the project, to remove garnet-bearing ore. There are no plans to backfill or reconstruct the excavated lands to their original elevations and that is not required in Montana law. The lands would be recontoured, but the topography would not be similar to the surrounding area after the site is reclaimed. The final reclaimed surface would partially blend into the existing contours of the lands. Man-made mine highwalls would be reclaimed as rock slopes.

Chapter 5: Consultation and Coordination

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Chapter 7: Comments on the Draft EIS

Comments on the Draft will be compiled and summarized in the Final EIS.

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